VOL. 79 No. 2027
MAY 17 1958

Telephone: FLEet Street 3212 (26 Lines)
Telegrams: Allangas - Fleet - London

Editor M. C. HYDE
Manager H. A. WILLMOTT
Director N. B. LIVINGSTONE WALLACE

Midland Office
Daimler House, Paradise Street, Birmingham. [*Midland* 0784-5]

Leeds Office
Permanent House, The Headrow, Leeds 1. [*Leeds* 22601]

Scottish Office
116 Hope Street, Glasgow C2. [*Central* 3954-5]

IN THIS ISSUE

Oversupply of Uranium?	908
Inadequacy of DSIR Resources	909
Distillates	910
Advances in Steroid Research	911
Combined Desulphurising Plant	912
Leather Research Open Days	912
Recruitment of Chemical Engineers	913
Instrumentation Review	914
Analytical Chemistry of Nitrogen	915
Review of Gas By-Products	917
Careers in Chemistry	918
Overseas News	919
Equipment Review	921
Commercial News	924
People in the News	925
Trade Notes	926
Chemical Stocks and Shares	928
Market Reports	928
Diary Dates	928
New Patents	930

Annual subscription is: home, 52s 6d, overseas, 60s, single copies 1s 6d (by post 1s 9d)

CHEMICAL AGE

BOUVERIE HOUSE · 154 FLEET STREET · LONDON · EC4

DSIR'S PROBLEMS

CONSIDERATION was given to the principal 'machine' for research in this country—the Department of Scientific and Industrial Research—in the presidential address given by Sir Hugh Beaver to the Institution of Chemical Engineers (reported in last week's CHEMICAL AGE, p. 869). Sir Hugh, a member of the Research Council of DSIR, during part of the period 1956-57, doubted whether DSIR in the form and with the methods found suitable 40 years ago—and in spite of recent changes it was not now materially different, he said—could discharge the duties that its title envisaged.

At the end of last week, the Council for Scientific and Industrial Research published its report for 1956-57. This Council was established under the DSIR Act, 1956. In the 14 months of its office, it has begun to re-assess the main functions of DSIR 'in the light of present-day circumstances' and to decide what changes, if any, there should be in policy and organisation. The report shows that the Council is fully aware of its task in seeking to ensure that resources at its command are deployed to the best advantage of the national economy and in such a way as to encourage increasing use of the results of research. But, and it is a large but, it gravely doubts the adequacy of these resources for all that it is charged to do.

All will agree that the need for increased research and for the application of the results of such research was never more important than at the present time, when industrial development must be the means of supporting and continuing to maintain this country in these highly competitive times. The Council has no doubts about this and the importance of the work of DSIR, and the evident need for this department to do more.

DSIR undertakes and supports pure and applied research to meet the needs of industry and the civil needs of Government; it makes provision for grants for training scientists and technologists and for helping British academic research to maintain its world position. In those industries that do not benefit directly from research done primarily for defence purposes, the value of production approaches £10,000 million a year. By contrast, DSIR is spending less than £10 million a year for *all* its activities.

During the 42 years of DSIR's existence three important groups of change have occurred. The place of pure and applied science in industry has grown out of all recognition. Since the first world war more than 20 times as many graduates are involved in pure science research and nearly 40 times as many doing technological research and development. During this period also, industries based on science, such as the chemical and electrical industries, have become leading and vitally important ones, and entirely new industries, such as electronics, plastics, synthetic fibres and rubber have emerged.

The second change has been in the setting up of research departments by most of the large companies, including public corporations. Indeed, as the Council points out, industry for its own purposes and as Government contractor, has become the largest employer of research workers. For the smaller companies, membership of specialised research associations is possible, and for all there has been a marked improvement in abstracting services and technical publications.

The way research is carried out has also undergone a noticeable change.

Today research requires co-operation, trained teams of workers, outstanding research directors and much careful planning to avoid waste of effort and to ensure valuable results and success.

So the Council in considering the role that DSIR must play asks four basic questions—What part should DSIR play in the conduct of pure research? What part should its own stations play in research of direct application to industry? Given the growing need for expensive team work, how should resources be allocated to avoid spreading them over too wide a field? To what extent can industries served by the grant-aided research associations be expected to shoulder the whole financial burden of an adequate research programme either now or in the near future?

Since DSIR's own stations represent the major financial responsibility of the Council, it is concentrating on the first two questions. On DSIR's policy towards research associations, the Council is not yet ready to report its 'fully considered views'.

On the first question, the Council states that the universities are, and will continue to be, the main centres of pure research, although it feels that a proportion of pure research should be carried out wherever applied research is done on any scale. It is pointed out that care must be taken to ensure that full use is made of the potential research capacity of university staff. At the same time the Council admits that DSIR has an important role to play here and it believes that its expenditure on this activity must rise considerably. In 1956-57, the Council recommended 115 grants for special research projects in science and technology, totalling £836,000 in value, compared with 47, totalling £400,000 in the previous year.

What part should DSIR's stations play in research of direct application to industry? The Council is reviewing the scope of the work but it is not yet ready to give a precise answer. It is emphasised that there is a large and growing field of activity in which the Government has a direct interest and a special responsibility, and in which, therefore, the research work required is appropriate to a national research establishment. The Council realises that in order to undertake new responsibilities, however, it is necessary to shed some of the existing load. As will be seen from p. 909 some action along these lines has already been taken with the handing over of some sections of the work to DSIR-aided associations.

The third question facing the Council is adequacy of DSIR resources. It is indicated that the department is spending less than £10 million a year for *all* its activities. Since ICI spent over £3 million on research last year the sum of only £10 million allowed for DSIR by the Government, should be immediately reviewed and increased.

Finally the Council is reviewing the extent to which industries served by grant-aided (to the tune of £1,531,784) research associations, could be expected to shoulder the whole financial burden of an adequate research programme either now or in the near future. Since the total annual income of these research associations is about £6 million, the Council's idea would not seem out of place, and it is to be hoped that action along the lines suggested may be taken in the near future.

OVERSUPPLY OF URANIUM?

TEN years ago leading Governments were faced with the problem of obtaining sufficient supplies of uranium to meet the defence requirements of the Western world. However, in the last six months there has been a threat of a surplus, at least in the short term. That surplus production of uranium is likely is indicated by the decision last week of the Canadian Government that any uranium producers having surpluses over and above supplies required under long-term contract to the British and US atomic energy authorities, may make private sales of the metal.

Exports of uranium will have to have a permit from the Atomic Energy Control Board and the Department of Trade and Commerce. Quantities of up to 250 lb.—it is not specified whether this means pounds of metal, or oxide or ore—may be sold anywhere for research purposes. No country, however, may receive more than 2,500 lb. unless it has signed an agreement for co-operation in the peaceful use of atomic energy.

This decision was followed a day later by the US Atomic Energy Commission who announced that domestic producers of uranium ores and concentrates could sell these materials privately to domestic and foreign buyers for peaceful uses. All sales would be subject to licensing by the Commission.

Fears of supply of uranium exceeding demand in South Africa, the second of the major Western producers (the third is the US) are the basis of talks at present taking place between the Union and the Anglo-US Combined Development Agency. An official announcement last Friday states that the Development Agency will, as from the end of June buy from the Union not more than 6,200 tons a year. It is not clear from this announcement whether this figure is to apply only for 1958-59. Last year South Africa's uranium production amounted to 5,700 tons so that there does not seem to be any immediate likelihood of some mines being asked to reduce production so as to accommodate newcomers.

That there is a likelihood of temporary over-production of uranium is considered to be due mainly to the long-term contracts placed when the main object was to secure sources of uranium at almost any cost. Remuneration was also fixed at a level which allowed even the most uneconomic mines to operate. This has, of course, influenced price of the metal.

Recently, there have been signs that the price of uranium is gradually coming down and, in fact, a world price appears to be emerging. The sales of surplus Canadian and US uranium is considered likely to hasten this development. Civil demand for uranium will be governed by price and it will be in the best interests of producers and users if economic deposits are worked.

At present it is proving difficult to form a satisfactory estimate of likely demand for uranium. Western defence needs require the major part of output and future defence needs—which are even more difficult to estimate—must be considered. Although civil atomic power programmes are now just getting under way, some considerable time must elapse before civil demands can be judged. Thermonuclear power can, it is felt, be ignored as an active competitor of the present type of atomic power stations for the next decade or so. Despite the difficulty of estimating uranium demand, it is generally held that there will be an oversupply for some little time ahead. The decisions of the Canadian and US Governments to allow exports of uranium for peaceful uses will no doubt assist Canadian and US producers. At the same time it seems evident that these Governments are unlikely to allow uranium producers to suffer having regard to the importance of the uranium industry in defence needs.

ADEQUACY OF DSIR RESOURCES IS IN DOUBT, SAYS REPORT

Charged to Do Too Much?

THE first report* of the Research Council for Scientific and Industrial Research for 1956–57, reviewing the work of the Department of Scientific and Industrial Research, indicates that the adequacy of DSIR's resources is in doubt having regard to all that it is charged to do, namely, not only the undertaking and support of both pure and applied research to meet the needs of industry and the civil needs of Government, but also the provision of grants for training scientists and technologists and for helping British academic research maintain its world position.

It is pointed out that in those industries that do not benefit directly from research done primarily for defence purposes, the value of production approaches £10,000 million a year. By contrast, DSIR is spending less than £10 million a year for *all* its activities. Appendix II shows that the Chemical Research Laboratory cost £160,404 (net), National Physical Research Laboratory £638,031, fuel research £330,502, pest infestation £83,341, water pollution research £90,020, and grants for research split up as follows: annual grants to research associations £1,424,830; special grants to research associations £126,954; grants to students, etc., £317,141; and grants to special researches £363,884.

Thorough Review

The Research Council, as the new executive council established under the DSIR Act 1956, instituted a thoroughgoing review of the activities of the department in pure and applied research in the light of the altered conditions of the present age. The main problems before the council and the way in which they are being tackled are reviewed.

This DSIR annual report has a new style of presentation from that of previous years. Instead of a comprehensive account of the activities of the DSIR stations, a short statement of progress in selected researches only is included. Further details of progress made by the department's stations will be published in their own annual reports. A separate volume to be issued in the near future will contain a summary of work done by the grant-aided research associations. The appendices attached to the present report contain information not published elsewhere, such as the distribution among the various branches of science of the awards to postgraduate students and the after careers of postgraduate students.

As a result of review of DSIR's activities by the Research Council, certain action has already been implemented. This includes the handing over of responsibility for some sections of the work of the department's Forest Products Research Laboratory to the Timber Development Association which receives a grant from DSIR. Another step is the proposal that the Agricultural Research Council should take over responsibility for the Low Temperature Research Station, Cambridge, and the Ditton Laboratory, East Malling, from the Food Investigation Organisation. This is being considered by the ARC. A further step which has been taken is to arrange that the Fuel Research Station will be closed early in 1959. That part of its work which will be continued will be transferred to the new station at Stevenage, since this station will have much wider scope and facilities for process development. Details have already been made public.

The council have also set up *ad hoc* committees to review the work and functions of three other DSIR stations—the National Physical Laboratory, the Chemical Research Laboratory and the Mechanical Engineering Research Laboratory. Some changes at the NPL have already been announced.

An indication is given of the progress of research carried out in the Chemical Research Laboratory of DSIR. Corrosion of metals is still on the laboratory's research programme. In a study of the inhibition of corrosion, the formation of an invisible composite film of iron and chromium oxides on the metal surface has been followed using radioactive chromium. A mixture of sodium benzoate and sodium chromate has been found to give better protection to a combination of copper and aluminium than other recommended methods.

Radiochemistry

In the field of radiochemistry, a number of dialkyl phosphates and certain amines dissolved in a kerosene diluent have been employed for the solvent extraction of uranium from sulphate leach liquors. Thorium, it is reported, has been recovered as a high concentrate from sulphuric acid solutions of monazite sand by selective adsorption of columns of phosphorylated cellulose. A considerable improvement in the form of standardised ore mixtures for use in the radiometric assay of uranium and thorium ores in the field has been achieved by incorporating the powdered ore in plastics mouldings.

Zone refining which has been employed for removing common impurities in antimony, tin, lead and tellurium, has not proved so successful with indium. However, zone-melting of indium tri-iodide is noted as reducing the content of lead, the most troublesome impurity, 'to a satisfactory level'.

During the year under review physicochemical properties of certain pure substances have been measured. Among these have been the critical temperatures of several organic compounds, pyridine-hydrogen, piperidine equilibrium constants, the second virial coefficients of a series of pyridine bases, and the dissociation constants of phenol and its alkyl homologues.

Progress is reported in the application of paper chromatography to fractionation of low molecular weight polymers and in the use of membranes of graded porosity to effect separation of polymer molecules in solution according to their chain length.

Success is reported in the operation of the fermentation process, on a 50-gallon pilot plant at Beckton, in collaboration with the London County Council. In this process sulphate-reducing bacteria are applied to produce sulphur from gypsum added to raw sewage sludge. The discovery that the final digested sludge settled readily, and that water was more easily removed than from sludge which had undergone the normal methane digestion, is regarded as of considerable importance to sewage undertakings.

At the Fuel Research Station there has been close collaboration with the Ministry of Power in research on oils and chemicals from coal. It is reported that the most important catalysts for the synthesis of oils and chemicals from carbon monoxide and hydrogen are those based on iron. Attempts have been made, the annual report states, to improve the performance of the cheaper mill-scale catalysts and to reduce the cost of producing the more expensive precipitated catalysts. Experiments have also shown that irradiation of unreduced mill-scale catalysts with gamma radiation from the radioactive isotope cobalt-60 brings about a significant and permanent increase in activity.

Brief details are also given on the progress of research at the Building Research Station, Fire Research Station, Food Investigation Organisation, Stored Products Laboratory, Hydraulic Research Station, Mechanical Engineering Research.

The Report of the Research Council of the Department of Scientific and Industrial Research is a Command Paper (Cmnd. 428) presented by the Lord President of the Council to Parliament, and published on 8 May by HMSO, price 4s 0d (72 cents US) by post 4s 4d.

Geigy Granted Permission at Glynllifon Site

CAERNARVON County Council have approved an application by Geigy Holdings Ltd. to build a chemical factory at Glynllifon Park, Caernarvon. Permission is restricted and does not authorise the production of heavy chemicals except as may be required in an ancillary manner for the production only of other authorised products on the site.

Answering criticisms that the council had hindered the establishment of the chemical works, Alderman R. W. Williams said that the proposal meant the impounding of water which involved the taking of levels of lakes, etc. 'We must do all these things in conformity with the law and we must respect the legitimate rights of all concerned, and that takes a long time'.

Alderman Williams went on to say that the council had consultations with the firm almost every week. 'We must consult the firm and have their approval because they are finding the money'. The firm, he went on, had not made any complaint and had not asked anyone to intervene on its behalf.

★ WHO pays for students undertaking fundamental research at universities? Certainly not industry, said Professor M. Stacey, Mason Professor of Chemistry, Birmingham University, speaking at a recent dinner of the Research Association of British Rubber Manufacturers. Out of 80 students, DSIR paid for nearly half. Agricultural and medical research paid for about 10. Less than 10 were directly paid for by industry.

Then, who provided the buildings wherein this fundamental research was done? Professor Stacey instanced Birmingham University, where of an expansion programme exceeding £10 million, all but £500,000 had come from the Government.

In many sessions with members of big firms, during which they had tried to find out why we in the UK were so good on fundamental research and so bad on exploiting it, the fact had come out that we were not alone in being good on such research, the US were equally as good and much quicker on exploiting it.

Most firms, said Professor Stacey, spent 2 to 3 per cent of their turnover on research and development. In the motor industry, the figure was about 10 per cent; in petroleum, 5 to 6 per cent; ICI spent between 3 and 4 per cent. And some firms spent only a fraction of a fraction of their turnover on fundamental research.

★ CHEMICAL merchants have their problems like the rest of us, but I sympathised fully with the difficulty faced by a north of England firm when its regular source of supply of wool wax residue recently ceased. CHEMICAL AGE enquiry department put the merchant in touch with another source for this residue left from wool wax alcohol after extraction of cholesterol.

Unfortunately for our enquirer, this new supplier quoted a price per lb. that was 1,300 per cent higher than his original source! Our enquiry department would be delighted to receive the name and address of any firm that can supply wool wax residue.

★ ANTICIPATING a good development rating, technologists of E.I. Du Pont de Nemours are in the middle of a project to increase production of their niobium and to improve the present process. The company is now turning out pilot plant quantities of the metal, primarily for evaluation. Experimental quantities of niobium and niobium alloys should be available to other firms in a few months.

Like titanium and silicon, the separation of niobium is a complex chemical process. Niobium is chemically tenacious and hard to purify and it is that characteristic rather than its rarity that has kept it from joining the ranks of the more popular metals. Niobium is as prevalent in the earth's crust as zinc and lead and 10,000 times more plentiful than gold.

Du Pont metallurgists report that a 1 lb., ¾ in. thick ingot can be cold-rolled into foil a thousandth of an inch thick without annealing. At high temperatures the pure metal oxidises rapidly. Several experimental alloys, however, show promise of having sufficient strength and oxidation resistance to be useful at temperatures up to 2,200°F. Alloys of the metal should allow new atomic piles to operate at higher efficiency; one of niobium's major attributes is its reluctance to absorb neutrons.

★ EVER since Bulganin and Krushchev brought their 'shopping list' to England some two years ago there have been rumours in the Press and elsewhere that the Russians were prepared to spend a vast amount on chemical plant and processes. The British Chemical Plant Manufacturers' Association has been in touch with the Russian officials for a long time and their appropriate member-firms have been kept in the picture. However, no definite orders have yet been placed and the Soviet Trade Mission at Highgate does not seem to have a set 'budget' to spend in the UK.

In addition to including the UK on their 'shopping list', the USSR is also negotiating in other western countries, particularly the US and West Germany. Obviously if business is placed in the UK—and it seems that it will eventually—orders will be big. The Russians are interested in complete chemical plants and processes, particularly in the plastics, synthetic fibres and resins fields. Negotiations between the USSR and ICI have been going on for more than two years on the question of producing Terylene in Russia.

Apart from its contacts with the West, the Soviet Union has also initiated co-operation with the Governments of East Germany, Czechoslovakia and other Communist countries 'to speed the development of the chemical industry'.

★ ALTHOUGH the USSR claims to be the world's second largest chemical producer, after the US, it has been known for some time that it has lagged behind the West in regard to production of synthetic fibres, plastics and other synthetic materials. This week, Mr. Krushchev told the Communist Party Central Committee that Russia was only sixth in world production of synthetic fibres and fifth in plastics production. It is tentatively planned to increase production facilities for artificial and synthetic fibres by 4.6 fold and those for plastics and synthetic resins, eightfold. A substantial increase in tyre production is also planned.

Mr. Krushchev said that the Soviet Government had allocated 100,000 million roubles (£8,900 million) for the development of Russia's chemical industry over the next few years. Apart from buying the necessary plant from other Communist countries and from the western world, the USSR is 'likewise willing to avail itself of the services of scientists, engineers, inventors and practical workers of foreign countries which might be helpful in solving the problems of raising the production of plastics and synthetic fibres', said Mr. K.

Negotiations have already been so protracted that UK executives in the chemical and chemical plant industries can be excused for not yet counting their chickens.

★ MANY will be disappointed that the Exeter conference of the Society of Chemical Industry, arranged for the benefit of members who cannot make the long trip to Ottawa for the annual meeting, will provide little scientific 'meat'. This conference, to be held in July, has the usual large number of visits—40 in all.

There are only five conference papers dealing with the 'Work of the DSIR', 'Industrial geology of SW England', 'The cow and the inquisitive chemist', 'Science and English literature', 'Some chemical aspects of plant disease control'.

Another SCI arrangement that disappoints me is the holding of the chemical engineering group's annual dinner during the run of the ACHEMA exhibition in Frankfurt and the conference of the European Federation of Chemical Engineers.

★ THE use of computers in analysing processes and techniques will doubtless be widespread before long. Right now, however, I am suitably amazed at the super efficiency of a new service offered to the US fertiliser industry by Monsanto Chemical Co., St. Louis. With their new fertiliser pilot plant coupled to an IBM electronic computer, Monsanto claim to provide a means of looking into the complete picture of fertiliser manufacture, including economics and operability.

Success of the operation hinges on selecting the right formulations or combinations of raw materials. Ordinarily there are 11 raw materials for use in fertiliser manufacture in the States. These materials can be combined in hundreds of different ways. But it takes an experienced fertiliser man anything from half-an-hour to two hours to calculate a single formulation by hand. Monsanto's computer does the same job in a few seconds.

This method of calculation also allows the producer not only to explore all possible combinations of raw materials, but also to study the economics of different combinations. Because the pilot plant can simulate production conditions existing in most fertiliser plants, practical problems of manufacture can be studied under actual plant conditions.

Alembic

ADVANCES IN STEROID AND POLYMER RESEARCH

Reports from Glasgow Royal College

A BRIEF record of the research work in progress in the various departments of the Royal College of Science and Technology in the session 1956–57, together with a list of the more important publications and the titles of theses approved for higher degrees, has recently been published.

Research in the department of chemistry which is headed by Professor F. S. Spring, has been mainly concerned with the elucidation of structures of natural products and embraces such fields as triterpenoids, steroids, pteridines and *iso*coumarins.

In the pentacyclic triterpene field, work has continued on the structure of α-amyrin, and the constitution of a related product, brein, has been established. The action of mineral acids on ursolic acid has been investigated and chemical studies on alnusenone have established the structures of some degradation products of the related friedelin. The structures of soyasapogenols A, B and C are now known. Work on soyasapogenol D continues.

Non-saponifiable constituents of local plants have been examined and been shown to contain a number of known triterpenoids. Whin (*Ulex europaeus*) has been found to contain β-amyrin, lupeol and soyasapogenol C. Lupeol has also been found in hawthorn bark (*Crataegus oxyacantha*) while ursolic and oleanolic acids have been identified in hawthorn fruit. Examination of thistle (*Carduus lanceolatus*) shows that β-amyrin and taraxasterol are present.

Chemistry of Hecogenin

In the steroid field, tetrabromoergosterol acetate has been shown to undergo molecular rearrangement on alumina with formation of two products whose structs are being investigated. The chemistry of hecogenin is being studied with a view to opening new routes to the synthesis of cortisone and aldosterone. Michael addition reactions involving pregnenolone derivatives are also being examined.

The structure assigned to the mould product mycophenolic acid has been confirmed by synthesis and also that of an *iso*coumarin derivative isolated from carrots. A new synthesis of analogues of isoalloxazine has been worked out and this has led to the preparation of an imino derivative of riboflavin which may prove to be of biological interest. Preliminary investigations are being carried out of the *in vitro* conversion of nuclosides to certain naturally occurring pteridines.

Micellar solutions are the subject of investigations in the physical chemistry laboratories of the Royal College. Some exploratory experiments on their elastic properties have been carried out. The photochemical behaviour of iron solutions in relation to hydrolysis is being studied. An electrochemical investigation of the rate of oxygen evolution at metal and metal oxide electrodes in the presence of hydrogen peroxide has been further developed. A study of the efficiency of oxides of different types of catalysts for the decomposition of hydrogen peroxide in the vapour phase has been continued and involves the activation of the otherwise inert *n*-type oxides, zinc oxide and cadmium oxide.

In the inorganic laboratories, the Carr-Price reaction has been studied and a polarographic examination made of some metal ion systems. In the microanalytical laboratory, a direct titration method for determining chlorine in organic compounds has been developed.

Consolidation and extension of the various lines of research being undertaken in the department of chemical technology has occurred. In the field of high polymer chemistry and technology, qualitative studies on the mode of thermal breakdown of various industrial polyesters continued actively; and, as a logical extension, quantitative kinetic studies have been commenced.

Vinyl Polymerisations

Interaction of vinyl monomers with halogenated hydrocarbons is being investigated, and experiments are also in hand on certain vinyl polymerisations in the non-stationary state. The mode of attachment of dyestuffs to polymeric fibre substrates is still under investigation, together with the photochemistry of the adsorbed dyestuff molecules.

A major item on the department's research programme for some years has been basic studies on diffusion processes in natural fibrous polymeric materials, with particular reference to their drying on the industrial scale. This programme is being expanded, notably to heat and mass transfer phenomena in systems of polymeric textile fibres in motion.

Several problems related to the fuel industries are also under investigation. A gas-chromatographic study of the constituents of certain low-temperature coal-tars is now nearing completion; and the oxidative degradation of mineral oils is being actively studied.

Previous investigations of airborne mine-dusts have now taken a new direction, it is reported. Work on the analysis of such dusts and on their surface chemistry is being discontinued for the present, and efforts are being concentrated on the fundamental principles of 'knock-down' of dusts by aqueous sprays. Work also continues on the recently initiated study of industrial vacuum crystallisation and related topics.

Main researches in chemical engineering have dealt with transients in heat transfer, vacuum filtration and distillation. Preliminary experimental studies on filtering slurries of spherical particles of varying sizes have been completed. These will serve as a basis of comparison with results for irregular particle shapes. In the work on distillation, heat and mass transfer rates in two-component systems have been investigated for film flow and bubbling flow, as a preliminary to column investigations.

Work of interest to metallurgists carried out at the department of metallurgy will shortly be published by J. D. Baird and J. Taylor ('Free energy formation of silicon carbide and the activity of silica in slag solutions') (*Trans. of the Faraday Society*). The carbon monoxide pressure of the reaction $SiO_2 + 3C = SiC + 2CO$ has been measured at temperatures between 1,400°C and 1,580°C. Precautions were taken to minimise the effect of silicon monoxide diffusion and ensure that the true equilibrium pressure was measured. The free energy of formation of silicon carbide has been calculated from the results.

The value obtained is stated to be considerably 'smaller than that obtained by previous workers. The recommended equation is:

$$\underset{(liq)}{Si} + \underset{(\ )}{C} = SiC$$

$$\triangle G^\circ = -19{,}250 + 8.3\,T \text{ cals.}$$

in which the $\triangle H^\circ$ term is approximately 5,000 cals. lower than the previous figure. According to these new data silicon carbide should dissociate into liquid silicon and graphite at about 2,050°C.

Reaction pressures have also been measured in a series of lime-silica and lime-alumina-silica slags. The new data were then used to calculate silica activity values.

Pyridine-4-sulphonhydrazide and a number of related substances have been prepared for study as antituberculous agents at the school of pharmacy attached to the college. In collaboration with the department of pharmacology of the University of Glasgow, a new series of tris-quaternary compounds has been synthesised. Certain members of this series have proved to be potent neuromuscular blocking agents.

A new spectrophotometric assay, which is described as rapid and sensitive, has been developed for the determination of αβ-unsaturated aldehydes and ketones (e.g. citral, carvone and cinnamaldehyde) in volatile oils and tablets (e.g. methyltestosterone and ethisterone in tablets).

A survey is being carried out of the distribution and the nature of unsaturated-fat oxidase activity in plants. The function of true lipoxidase and its distribution is being studied and data on unsaturated-fat oxidase activity in general with reference to its role in promoting oxidative deterioration in the processing and storage of food is being investigated. Work is also proceeding on the detection and estimation of true lipoxidase activity by a micro-manometric technique.

In the department of food science investigations have been carried out on a number of short-term problems including cereal protein chemistry, freeze-drying and the stability of commercial fats. Work continues on lipids with reference to the unsaturated-fat oxidases. The main research of the department, however, is concerned with the fall-out of radioactive strontium from nuclear test explosions and the consequent contamination of pasture and foodstuffs.

NEW COMBINED DESULPHURISING AND SULPHURIC ACID PLANT

A NEW combined desulphurising and sulphuric acid plant has been developed by Appleby-Frodingham Steel Co., Scunthorpe. Claimed to incorporate major advances on any existing similar process, it is the result of 10 years of experiments and pilot plant. The first full-scale plant is now being installed at Scunthorpe and is due for completion by mid-1959.

At most integrated steel works a certain proportion of coke oven gas is used to fire the open-hearth melting furnaces, the remainder being used in reheating furnaces and soaking pits. This gas contains about 1 per cent of sulphur which, apart from adding to the difficulties of making low sulphur steel, results in considerable quantities of sulphur dioxide being released into the atmosphere. In an integrated works making 1 million tons of steel ingots a year the use of the Frodingham desulphurising process enables the sulphur dioxide to be recovered, from which as much as 250 tons of sulphuric acid can be produced each week.

In the case of ordinary gas works supplying town's gas, there is a statutory obligation to reduce the sulphur content of the gas to the equivalent of less than two parts per million by volume of sulphuretted hydrogen, a necessity which entails the provision of costly and extensive purification plant. Even after this is done, however, there remains a residue of organic sulphur which cannot be removed in existing purification equipment, and which causes corrosion in domestic hot water and similar appliances.

The plant developed by Appleby-Frodingham, which consists essentially of a fluidised hot iron oxide absorber and regenerator, is capable of removing both hydrogen sulphide and organic sulphur to very low levels; at the same time, too, it enables the recovery of considerable quantities of sulphuric acid. The heat requirements of the plant are met by the combustion of the absorbed sulphur and, once started up, it is self-sustaining for heat.

A pilot plant has been in successful operation for two years, purifying up to 3 million cu. ft. of coke oven gas per day. The full-scale plant, when completed, will deal with 32 million cu. ft. of gas per day.

Because the process employs hot gas, it is claimed to be very much faster than conventional iron oxide boxes or purification towers, while the use of fluidised beds reduces the amount of spent oxide by four-fifths and simplifies its handling and distribution. In compactness and capital cost, the process compares very favourably with existing methods, while the entire operation of the full-scale plant is capable of being handled by two men per shift.

Under the provisions of the Clean Air Act the height of chimneys discharging sulphur dioxide to atmosphere may be subject to regulation and this, say the company, combined with the economic and technical factors already mentioned, suggests that the new Frodingham desulphurisation process is likely to be of particular interest to the steel industry, the gas industry—especially in the case of the larger gas works—and the chemical and petroleum industries.

Appleby-Frodingham have appointed two licensees to build plants based on this process. They are Henry Balfour and Co. Ltd., Leven, Fife, and W. J. Fraser and Co. Ltd., Romford, Essex. The unit at present under construction at the Appleby-Frodingham works is being built by W. J. Fraser.

High-Performance Impregnated Leathers

A THIRTY per cent improvement in durability of impregnated vegetable tanned leathers for all-leather army boots, in comparison with the average for a number of high quality army reserve leathers, was claimed by Dr. K. W. Pepper, director of the British Leather Manufacturers' Research Association, in his lecture 'Some current research on heavy leather problems'. This was given on 7 May in connection with the BLMRA's open days at Egham.

Dr. Pepper said that some simple, inexpensive, commonly used impregnants (waxes, greases and rosins) had given the same degree of improvement as the more expensive polyisobutylene.

Two possible types of waterproofing treatment were discussed: filling treatments, which filled the capillary pores in the leather with an insoluble impermeable substance and non-filling treatments, whereby surfaces of the tanned collagen fibres were made so water-repellant that the passage of liquid water was prevented.

Non-filling methods involving chrome or aluminium soaps had given useful results on full chrome sole leather. A number of waterproofing treatments for full chrome upper leathers had been examined and the best, although the most expensive, employed silicones from organic solvents. Samples of sole leather treated in this way had shown excellent resistance to water and the BLMRA had applied for a patent for a process incorporating a 'rubbery material with the silicone'. This reduced the amount of silicone needed to more economic levels.

Open-day visitors to the industrial and heavy leather department were told that polyester rubbers could be polymerised inside heavy and light mineral-tanned leathers to give an almost complete fill of void space.

Results of investigations on the sterilising of six calf skins by irradiation at Harwell were shown in the biology department. These skins had been stored for seven months at the BLMRA in stout polythene bags. Visitors saw the skins after chrome tanning with a pack of ordinary calf skins. The irradiated skins were well preserved and the leather was satisfactory. Irradiation had had no adverse effect on the skins.

Redundancy at Glaxo's Barnard Castle Works

A REDUCTION in demand for penicillin products, mainly in export markets, has resulted in a lack of work in the sterile, processing and packaging departments of the Barnard Castle, Co. Durham, factory of Glaxo Laboratories.

A statement issued on Tuesday by the company said that discussions were proceeding between the management and staff representatives on the Factory Joint Advisory Council on the method to be adopted to meet the situation, and a final decision was expected on Wednesday evening.

The Barnard Castle factory contains fermentation plant for making antibiotics and vitamins. It also packs Glaxo's entire output of dry sodium penicillin for injection. Total number of workers at the factory is about 700, of whom one-third are engaged on packing operations.

Scaling-up Symposium Papers Published

'PROCEEDINGS of the joint symposium on the scaling-up of chemical plant', held in London on 28 and 29 May 1957, have now been published by the Institution of Chemical Engineers. The symposium, which was reported in CHEMICAL AGE, 1 June 1957, p. 925, was organised by Het Koninklijk Institut Van Ingenieurs, De Koninklijke Nederlandse Chemische Vereniging, The Society of Chemical Industry and The Institution of Chemical Engineers.

Copies of the proceedings may be obtained, price £2 for members of the sponsoring bodies, £3 for others, from the Institution, 16 Belgrave Square, London SW1.

Whiffen May Increase Ethylene Urea Production

Production of ethylene urea at the Loughborough works of Whiffen and Sons Ltd., Fison House, 95 Wigmore Street, London W1, may be increased in the 'not too distant future' say the company. Whiffen have been manufacturing ethylene urea for the past 15 to 18 months and since the initial manufacture began production has increased by 400 per cent.

As far as the UK is concerned, it is believed that demand will be fully met and there will be supplies available for the export market.

Atom Pay Increases Refused

Talks on Monday on the pay claim for scientists and technicians employed by the Atomic Energy Authority ended in deadlock. The Institution of Professional Civil Servants who put forward the claim will meet on 22 May to consider its next moves.

The IPC had demanded increases of up to £1,000 a year. Sir Donald Perrott, finance and administration member of the AEA, is understood to have told the union negotiators that such additions to the authority's cost could not be afforded.

I. CHEM. E. SEEKS TO RAISE LEVEL OF RECRUITMENT

THE YEAR 1957 was a memorable year in the history of the Institution of Chemical Engineers, the annual report of its council states. On 8 April, 1957, a Royal Charter of Incorporation was granted and H.R.H. Prince Philip became its Royal Patron.

The accounts for the year ending 31 December, 1957, reveal a serious deficit—the first since 1951. The rise in costs of publications of the institution, and salaries, and high expenditure on rent, rates, examinations and postal charges have all contributed to this deficit.

Membership of the institution has increased by 338 to 3,823. However, special attention has been given to recruitment as there are indications that chemical engineering is not attracting a sufficiently high proportion of the best boys from grammar and public schools. This is believed to be due to (1) insufficient information being available in the schools about careers in chemical engineering; and to (2) the idea that engineering has less glamour than science.

The institution's Careers Advisory Committee on investigation of the careers literature available from the institution came to the conclusion that the advantage of chemical engineering lay not in starting salaries although these were on an average as good as in any other branch of science or engineering, but in opportunities for promotion to the highest posts which professional qualifications in chemical engineering provided.

With regard to the committee's investigation of opportunities for women in chemical engineering, the opinion was formed that an able and determined young woman could succeed in this profession but vacancies for women chemical engineers in the chemical and allied industries would be limited in the near future. Opportunities existed in companies large enough to have sizeable research and development departments and in organisations concerned exclusively with research and development. There was a general reluctance to employ women in plant management.

Reporting on education and training the council state that the significance of the symposium on 'Chemical Engineering Education' organised by the Midlands branch of the institution, was the confidence inspired by the members of the chemical engineering teaching profession 'in their determination, sense of urgency, and ability to turn out an ever increasing number of well-trained chemical engineers.' The most disturbing aspect of the meeting was the emphasis, over and over again, on the shortage of chemical engineering teaching staff.

With the further elimination of technology from the degree course, the need for graduate training in industry before employment on responsible chemical engineering work is emphasised. Following representations early last year, the Ministry of Labour decided to extend the rules for deferment to cover two-year postgraduate apprenticeships in chemical engineering approved by the institution. Schemes submitted by the following had been approved:

Albright and Wilson (Mfg.) Ltd.; British Coking Industry Assoc.; British Enka Ltd.; Constructors John Brown Ltd.; Distillers Co. Ltd.; research and development dept., Dunlop Research Centre, Dunlop Rubber Co. Ltd.; W. J. Fraser and Co. Ltd.; Kellogg International Corp.; Power-Gas Corp. Ltd.; Shell Refining Co. Ltd., Peter Spence and Sons Ltd.; John Thompson Ltd.; and Union Carbide Ltd., chemicals division.

In an attempt to give encouragement to courses for the Diploma in Technology the council has made a declaration of intention in regard to the recognition of the Dip. Tech. (Eng.) in Chemical Engineering. The institution will exempt holders of the National Diploma in Chemical Engineering from Parts 1 and 2 of the institution examination. Exemption from Part 3 will be considered at a later date on the basis of the council's rules for recognition. The Higher National Certificate courses in chemical engineering are stated to be making an appreciable contribution to the supply of chemical engineers.

One-day Meeting on Polarography at ICI, Ardeer

A one-day meeting of the Polarographic Society will be held at Ardeer, Ayrshire, on Friday, 26 September, 1958, by permission of ICI Ltd., Nobel division. Papers will be given as follows:

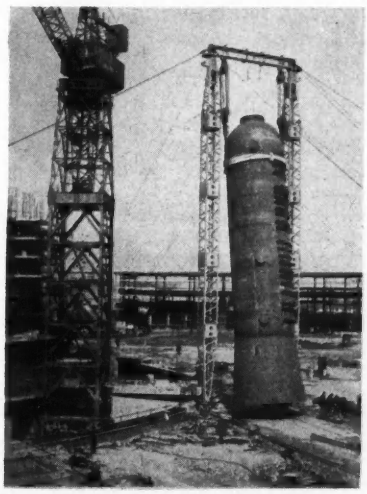
Title	*Author(s)*
The polarography of sodium hydro sulphite	Professor I. M. Kolthoff
Polarometric measurements of respiration in biological systems	Dr. F. Holton and Dr. R. B. Beechey
Recent advances in A C polarography	Mr. R. Faircloth
Conductivity measurement	Dr. V. S. Griffiths
Cathode protection	Mr. C. L. Wilson
Some problems in the polarographic analyses of semiconductors	Mr. D. R. Curry
The use of the polarograph in studying metal complexes:	
(a) the determination of stability constants	Dr. F. J. C. Rossotti
(b) the study of some new metal chelating agents	Dr. T. S. West
Polarographic determination of dibutyl phthalate in propellant compositions containing nitroglycerine	Mr. A. F. Williams

Arrangements for the meeting, which will include a visit to the Research Laboratory and Works at Ardeer, are in the hands of Mr. A. F. Williams, Research Department, Imperial Chemical Industries Ltd., Nobel Division, Stevenston, Ayrshire.

Accommodation will be strictly limited. All those interested should write to Mr. A. F. Williams as soon as possible, and in any case not later than 31 May, 1958; he will also send details of hotel accommodation.

First Heat Exchanger at Berkeley

THE FIRST of the 16 large heat exchangers for the Berkeley nuclear power station was recently erected on the site by John Thompson Ltd., Wolverhampton. To avoid transportation of excessive loads from the Wolverhampton works and at the same time to reduce to a minimum the work to be done on the site, the vessel was manufactured in seven sections at the home works and then welded up in a site boilershop specially erected at Berkeley. This site boilershop accomodates four vessels at a time.



The heat exchanger vessel, which is 70 ft. long by 17 ft. 6 in. diameter and weighs 133 tons, is here being lifted to its full height. The tail bogie has been removed and the vessel is about to be lowered on to its foundations

X-ray of all welded seams in the sections, which are produced to class 1 welding specification, is executed in special bays equipped with gantry-mounted 250 Kv X-ray sets. Stress-relieving of the sections is carried out in an oil-fired annealing furnace whose internal dimensions are 45 ft. by 22 ft. by 22 ft.

Water tubes for the gas/water heat exchanger within the vessel are prefabricated into tube packs at Wolverhampton and sent to Berkeley in clean, polythene-wrapped condition, for building up unit-by-unit inside the vessel.

L. Light Issue 1958 Catalogue

Organic research chemicals and auxiliary materials are listed in the new 1958 catalogue issued by L. Light and Co. Ltd., Poyle Estate, Colnbrook, Bucks. The company have just completed a year of building and reorganisation: new stores, extra offices, analytical and research laboratories are all now in use, resulting in increased production.

Turnover of the company has increased ten-fold in the last 10 years and exports continue at 60 per cent.

Instrumentation Review

Use of Infra-Red Analyser to Determine Acetone in Gases

THREE British firms are producing nuclear magnetic resonance spectrometers, with wide variations in price. No doubt there will be some differences in performance when the opportunity occurs to compare their behaviour. A relatively inexpensive model is produced by the Fairey Aviation Co. The prototype is reported to be capable of operating recorders and controllers. The Mullard n.m.r. spectrometer is described as a complete system providing all that is necessary for high resolution proton spectrography by magnetic resonance. Information is also available on the Metropolitan-Vickers high resolution n.m.r. spectrometer.

Acetone in gases. The concentration of acetone in gases can conveniently be determined continuously, using the Grubb-Parsons infra-red gas analyser which provides full-scale deflection for 0.25 per cent by volume, with a discrimination ratio of 20 to one between acetone and methyl alcohol. A gas flow rate of the order of 400 ml. per minute is adequate and registration of acetone concentration may be obtained on an indicating meter, cathode-ray oscilloscope or recording potentiometer or microammeter. Provision is made for operating alarm devices or control equipment. Manufacturer—Sir Howard Grubb, Parsons and Co. Ltd., Walkergate, Newcastle on Tyne 6.

Water Hardness Meter

Calcium in liquids. The water hardness meter, developed by Nash and Thompson with the Central Electricity Authority, for examination of boiler feed water quality, may well also prove applicable to the monitoring of the calcium content of other liquids, particularly at low concentrations. The accuracy obtainable is ± 1 p.p.m. and since the unit is designed to operate warning lights, alarm systems and automatic control gear while monitoring at concentrations of the order of 3–5 p.p.m., the instrument has interesting possibilities in automation of chemical plant, once its versatility has been proved. Investigations are currently proceeding on the practicability of other applications, in particular the continuous indication of chlorine in drinking water. Manufacturer—Nash and Thompson Ltd., Oakcroft Road, Chessington Road, Surrey.

Carbon monoxide in gases. The concentration of carbon monoxide in gases, in the range 10 p.p.m. to 5,000 p.p.m., is determinable with an accuracy of ± 10 per cent using the palladosulphite tube method developed at the RAE, Farnborough (1); an instrument is now being produced incorporating this method, operating batchwise, and able to function even in the presence of hydrogen sulphide. The manufacturers are Combustion Instruments, 61 Belsize Lane, London NW3.

Carbon dioxide in gases. The Simplex mono carbon dioxide recorder instrument is based on absorption of the carbon dioxide and operates continuously with an accuracy equal to that of the Orsat apparatus. The percentage carbon dioxide is recorded on a chart. Manufacturer—James Gordon and Co. Ltd., Dalston Gardens, Stanmore, Middlesex.

Chloromethanes in liquids. Using a partition column the four chloromethanes can be resolved in eight minutes from a liquid sample with the Beckman gas chromatograph. Designed specifically for the analysis of gases and liquids boiling up to approximately 80 °C, the instrument is compact measuring only 20 in. by 16 in. by 9 in. A thermal conductivity cell having a short diffusion path length is fitted permitting the resolution of methane and air in 30 seconds. Manufacturer — Beckman Instruments Inc., Fullerton, California, US.

by

W. J. Parker

This article by W. J. Parker features instruments for determining:

(1) In gases: Acetone, ammonia, benzole, carbon monoxide, carbon dioxide, hydrogen, methane, nitrogen and oxygen.

(2) In liquids: Calcium, chloromethanes, fuller's earth, hydrazine, magnesium, metacresol.

(3) In solids: Nickel on steel.

Fuller's earth in liquids. The Spekker absorptiometer, apart from its conventional use, can also be used, with a pair of neutral filters, for turbidimetry, while a filament lamp used with the fluorimeter attachment converts it into a sensitive nephelometer permitting the detection of less than 1 p.p.m. of Fuller's Earth in distilled water. Manufacturer—Hilger and Watts Ltd., 98 St. Pancras Way, London NW1.

Hydrazine in water. The Cambridge residual hydrazine recorder is employed with boiler plants where hydrazine is used to remove the dissolved oxygen from the boiler feed-water. The instrument operates continuously and is based on electrolysis. The hydrazine content is registered on a chart recorder. Manufacturer—Cambridge Instrument Co. Ltd., 13 Grosvenor Place, London SW1.

Hydrogen in gases. An instrument has been developed by the National Coal Board, North Western Division, Scientific Department, Central Laboratory, Manchester. It is called a gas chromatograph for the determination of hydrogen in mine airs.

Meta-cresol in commercial grades. The estimation of meta cresol in its commercial grades i.e. in mixtures with phenol, ortho and para cresols, 2,4,2.5 and 2,6 xylenols and sometimes meta and para ethyl phenols, involves measurements by conventional infra-red methods at seven or more wavelengths with solution of the appropriate equations, or the precise location of a suitable 'base line'. Using an instrument for the production and measurement of second derivative infra-red spectra (2), direct measurements of percentage meta cresol can be obtained with an accuracy of ± 0.5 per cent compared with chemical methods, and each determination was completed within 10 minutes. The instrument also permits the estimation of constituents of crude tar acids without prior fractionation. Further information from—F. Singleton, Research Laboratory, R. Graesser Ltd., The Chemical Works, Sandycroft, Nr. Chester.

Methane in ethylene. The Perkin-Elmer process vapor fractometer (model 184) will permit the continuous monitoring of the concentration of methane in ethylene in the range 0.05 per cent up to 100 per cent with an accuracy of ± 1 per cent by recycling, or alternatively will operate batchwise. The instrument will operate remote indicators located up to 1,000 ft. from the unit and could operate controllers. Manufacturer—Instrument Division, The Perkin-Elmer Corporation, Norwalk, Connecticut, US.

Nitrogen Meter

Nitrogen in gases. A nitrogen meter for the investigation of lung function has been developed from the instrument used by Lilly and by Lunden and permits the determination of nitrogen continuously in the presence of other respiratory gases. At a flow rate of 30 ml. per minute the nitrogen concentration can be ascertained from a meter or can be continuously recorded without further amplification on standard pen recorders. The instrument has seven ranges with upper limits extending from 10 to 100 per cent nitrogen, and the time between sampling and 90 per cent response is 40 milliseconds. The reproducibility is in the region of ± 0.5 per cent. Further information from—Medical Research Council, National Institute for Medical Research, Pneumoconiosis Research Unit (Cardiff), Llandough Hospital, Penarth, Glamorgan.

Oxygen in gases. The determination of oxygen in gases has been approached by various methods, including a polarographic approach (3), but the Cambridge instrument is based on the Katharometer method and operates over the range 20 to 100 per cent oxygen. An enclosed dry battery supplies the Katharometer and the scale illumination circuits. Manufacturer—Cambridge Instrument Co. Ltd., 13 Grosvenor Place, London SW1.

REFERENCE

(1) *The Gas World.* 1954. 27 November, P. 1357.
(2) *Chem. and Ind,* 1955. 1519-1520.
(3) *Chem. and Ind.* 1948, 37-38

ANALYTICAL CHEMISTRY OF NITROGEN

Wide Need for Accurate Determination

THERE are few branches of chemistry, either industrial or academic, which do not call for accurate determination of groups containing nitrogen. Probably the two most important groups are the ammonium and nitrate radicals. Other nitrogen compounds for which methods of analysis are often required include nitrites, urea, hydroxylamine, hydrazine, cyanides and thiocyanates. At a recent meeting of the Midlands Section of the Society for Analytical Chemistry held in the University, Birmingham, Mr. A. F. Williams (Imperial Chemical Industries Ltd., Nobel division) presented a paper on 'The analytical chemistry of nitrogen'.

In the simple distillation method for determination of ammonia only volatile basic substances, e.g. pyridine and tar bases, interfered, said Mr. Williams. A useful modification was to distil into a weak solution of boric acid, then the ammonia could be titrated directly to methyl orange.

A method sometimes used for determination of ammonia in ammonium salts was based on reaction with formaldehyde to yield hexamethylenetetramine. The acid liberated from the salt was then titrated (1). The procedure did not appear to be quantitative but this might be partly due to the indicator. Kolthoff (2) designated phenol red, neutral red, rosolic acid and bromothymol blue as the only satisfactory indicators. Norris and Ampt (3) recommended titrating to a full yellow with cresol red. By careful standardisation, the procedure (4) had been applied with reasonable success to ammonium nitrate.

Oxidation with Hypobromite

Another volumetric procedure which had been widely studied involved oxidation with hypobromite, whereby ammonium salts were oxidised to nitrogen. It was generally considered that the reaction was not quantitative, however, and a factor was often employed in the determination. Kolthoff and Laur (5) claimed that, in all cases, high results were obtained due to some oxidation of ammonia to nitrate. Köszegi and Salgo (6) modified Kolthoff's procedure. Standard potassium bromate was used as a source of bromine which was converted into hypobromite immediately before reaction with the sample. These workers claimed an accuracy of $\pm$ 0.09 per cent. A coulometric titration procedure using electrically generated bromine had been described by Arcand and Swift (7) for small amounts of ammonia.

Both the chloroplatinate method (8) and reaction with tetraphenylboron (9) could be used for gravimetric determination of ammonia, although in the latter case the precipitate had to be dried at a lower temperature, namely, about 70°C, in contrast to 100°C which could be used for potassium (10,11).

The colorimetric Nessler procedure for ammonia was well known. The reaction based on development of an intense blue colour on addition of phenol and hypobromite to ammonia had been recently studied (12). An advantage of using thymol instead of phenol was the solubility of the reaction product (indophenol) in organic solvents.

Nearly all methods for determination of nitrate were based on reduction techniques and the same procedures could often be extended to determination of nitro groups in organic compounds. The method based on reduction to ammonia using Devarda's alloy was well known. By employing a colorimetric finish, it could be applied to small amounts of nitrate. Dickenson (13) had described an ammonia titration procedure for determination of nitrate in fertilisers. Recently, reduction of nitrate to ammonia by heating with a mixture of reduced iron and sulphuric acid had been studied This was of particular interest to soil analysts (14).

'Bowman and Scott'

A considerable amount of work had been carried out on determination of nitrates by application of the 'Bowman and Scott' procedure (15), involving reduction to nitric oxide. It was a very useful method for determination of nitrate ions in inorganic salts and mixed industrial acids, also for acids derived by hydrolytic procedures from certain organic nitro compounds or esters; it involved titration with ferrous ammonium sulphate in strong sulphuric acid solution. The titration could be carried out directly with visual observation of the pink colour of the solution at the end-point.

An electrometric method, using platinum and Brightray 'B' (Ni-Fe-Cr alloy) electrodes had been successfully used for location of the end-point (16). Krejci and Kacetl had employed platinum-carbon electrodes for the same purpose (17).

A particular value of the relatively simple 'Bowman and Scott' procedure was in its application to nitric esters, such as nitroglycerine and nitrocellulose, which were fairly easily hydrolysed to nitric acid in strong sulphuric acid solution.

Another method having found considerable use in determination of nitric esters was the well-known Lunge method which involved reduction with metallic mercury, followed by measurement of the nitric oxide evolved. This method was in general use for analysis of nitrocellulose.

Nitric esters, such as nitroglycerine, were so easily reduced that they could be determined by titration in aqueous solution with ferrous ammonium sulphate in an inert atmosphere.

A widely-used procedure for determination of aromatic nitro groups, as in nitroresorcinols and picric acid, involved reduction in acid solution with titanous sulphate solution previously standardised against a standard nitro compound. Excess titanous sulphate was titrated with ferric alum solution.

Belcher and Bhatty (18) used chromous chloride for reduction of nitro compounds, followed by Kjeldahl treatment of the amines produced.

Gravimetric methods were rarely used for determination of nitrate and except for Nitron (19), $C_{20}H_{16}N_4$, which formed a fairly insoluble crystalline nitrate, $C_{20}H_{16}N_4.HNO_3$, there was no well-tried gravimetric reagent. Busch (20) had first described application of the reagent and subsequently Winkler (21) laid down optimum conditions for precipitation, etc. Other reagents which had been proposed for determination of nitrate included di-(I-naphthylmethyl)amine acetate (22) and cinchonamine (23). More recently, dicyclohexyl-thallium (III) had been recommended as a promising reagent (24). A useful review of gravimetric reagents for nitrate had been published (25).

Colorimetric methods for nitrate ions were usually based on evaporation with phenol and sulphuric acid, followed by dilution with excess alkali. For this determination 2:4-xylenol was widely used. A method had been published for determination of nitrate in soil extracts using this procedure (26).

Nitrites were usually determined by making use of the readiness with which they were oxidised to nitrates. Thus, they were oxidised in aqueous solution by solutions of ceric sulphate or potassium permanganate, forming the basis of volumetric procedures. There was an indirect method of determination based on reaction with sulphamic acid (27).

Colorimetric Methods

Colorimetric methods for small amounts of nitrite were nearly always based on diazotisation and coupling with a phenol. It had been claimed that 2-amino-4-chloromethylthiazole hydrochloride was an extremely sensitive reagent. A red colour was obtained with nitrite ions.

Korenmann and Belyakov (28) claimed that mercuration of secondary and tertiary arylamines increased sensitivity of the colorimetric reaction with nitrites by 2.5 to 16 times.

There were two well-established methods for cyanides, namely, Liebig's and Volhard's methods. In Liebig's method, if ammonia was added to the cyanide solution instead of potassium hydroxide, silver cyanide was not precipitated at the end-point but if an iodide was present, the end-point was indicated by precipitation of yellow silver iodide.

In titration of alkali cyanide with nickel sulphate solution, murexide had been used as indicator and the reaction had been studied with reference to interferences (29).

A number of colorimetric methods were available for cyanide. P-dimethylaminobenzylidenerhodanine, a reagent for mercury, formed the basis of an indirect procedure for cyanide since cyanide ion complexed with mercury. Another useful method involved measurement of deepening of the colour of potassium nickelocyanide.

Thiocyanates could be determined by Volhard's method; another determination was by titration with mercuric nitrate using

diphenylcarbazone as indicator (30) in the same manner as chlorides. Sodium nitroprusside had also been employed as indicator, a turbidity being obtained with free mercuric ions; this method had been used for determination of thiocyanate in coal-tar pitch and its fractions (31).

Sant (32) had developed a method for thiocyanate based on oxidation by iodine at pH 9 to 10, adjusted by a borax-boric acid buffer, and subsequent titration of excess of iodine with sodium arsenite. Suseela (33) had studied oxidation of potassium thiocyanate by alkaline potassium ferricyanide in presence of osmic acid. Desmukh and Joshi (34) stated that oxidation of thiocyanate to sulphate with potassium permanganate was normally only 95 per cent complete. Iodine monochloride was recommended as catalyst and indicator and careful control of acid concentration to 1.5–2N was advised. The end-point was indicated by disappearance of the brown colour in the carbon tetrachloride layer. The same workers (35) described a method in which thiocyanate was oxidised quantitatively by ceric sulphate.

Andrew's Conditions

In addition, thiocyanate could be determined by using Andrew's conditions, i.e. titrating with potassium iodate in 4–6N hydrochloric acid solution (36).

Because thiocyanate was often associated with cyanide, determination of each in the presence of the other might be required. This could be accomplished by a combination of Liebig's and Volhard's procedures. Alternatively, a gravimetric procedure might be used for direct determination o thiocyanate by oxidation of the sulphur to sulphate.

Finally, Mr. Williams considered techniques used in analysis of less common nitrogen containing compounds, such as hydroxylamine, hydrazine and urea, which were, however, often widely used in chemical processes.

Probably the best known method for determination of hydroxylamine was that based on oxidation with potassium bromate in presence of hydrochloric acid (37).

It had been claimed that hydroxylamine, also hydrazine, could be conveniently and accurately determined by direct potentiometric titration with O.1M potassium ferricyanide in 10 to 25 per cent potassium hydroxide solution (38). When the concentration of potassium hydroxide exceeded 25 per cent, results were no longer reproducible. Another method, also based on oxidation of hydroxylamine by potassium ferricyanide in alkaline solution, utilised a borax-boric acid buffer and results were claimed to be in close agreement with those obtained by the classical bromate procedure (39).

A method had been described for determination of hydroxylamine by oxidation with standard ferric alum solution, excess of which was titrated with mercurous nitrate solution in presence of ammonium thiocyanate (40).

Hydrazine reacted with potassium iodate under Andrew's conditions and could be determined in this way (36). Singh and Sood (41) employed a method based on titration with Chloramine B. In another method, hydrazine was oxidised by alkaline permanganate (42).

With sodium hypobromite, urea reacted similarly to ammonia. The reaction was not quantitative and, if used, a factor should be determined, based on measurement of the volume of nitrogen evolved. A very common method used for determination of urea in biological materials utilised its conversion to ammonia and carbon dioxide by means of the enzyme urease (43, 44, 45). The ammonia or carbon dioxide could be estimated in a conventional manner. This method had been investigated in connection with analyses of industrial liquors, such as those containing ammonium nitrate and nitric acid in addition to urea. The method was found to be less satisfactory than the 'Xanthydrol' method described below.

An excellent method for determination of urea was based on its reaction with xanthydrol in presence of acetic acid, a precipitate of dixanthydryl urea being obtained and this could be determined gravimetrically (46). Slight modifications introduced by Kiech and Lock (47) gave greater accuracy. This method had the advantage that it was applicable in presence of ammonium salts. A procedure, in which the amount of urea present was equivalent to one-seventh of the weight of precipitate $(C_{12}H_8OCHNH)_2CO$, had been worked out for mixtures of urea with ammonium nitrate (48).

Bitskei (49) claimed that urea could be determined titrimetrically by oxidation with sodium hypobromite in weakly alkaline solution in presence of bromide ion.

Rangier and Krebs (50) had put forward a method for separating ammonia from urine without affecting the urea. It was based on use of the iodometric reagent ($HgCl_2$, KI, KCl and KOH) which precipitated ammonia as a complex but had no affect on urea.

REFERENCES

(1) J. T. Grissom, *J. Ind. Eng. Chem.*, 1920, **12**, 172.
(2) I. M. Kolthoff, '*Die Massanalyze*', Berlin, Julis Springer, 1928, **2**, 186.
(3) J. H. Norris and G. Ampt, *Soc. Chem. Ind. Victoria, Proc.*, 1933, **33**, 801.
(4) Imperial Chemical Industries Ltd., *Nobel Division*, Private Report.
(5) I. M. Kolthoff and A. Laur, *Z. anal. Chem.*, 1928, **73**, 177.
(6) D. Köszegi and E. Salgo, *Z. anal. Chem.*, 1954, **143**, 423.
(7) G. M. Arcand and E. H. Swift, *Anal. Chem.*, 1956, **28**, 440.
(8) A. I. Vogel, '*A Text-Book of Quantitative Inorganic Analysis*', Longmans, Green and Co., 1951, 491.
(9) W. Rüdorff and H. Zannier, *Z. anal. Chem.*, 1953, **140**, 241.
(10) Imperial Chemical Industries Ltd., Nobel Division, Private communication.
(11) W. W. Wendlandt, *Anal. Chem.*, 1956, **28**, 1001.
(12) L. N. Lapin, Trudy Komissii, *Anal. Khim. Akad. Nauk*, SSSR, 1954, **5**, 77.
(13) W. E. Dickenson, *Anal. Chem.*, 1954, **26**, 777.
(14) J. M. Bremner and K. Shaw, *Analyst*, 1955, **80**, 626.
(15) F. C. Bowman and W. W. Scott, *J. Ind. Eng. Chem.*, 1915, **7**, 766.
(16) W. C. Easterbrook, Imperial Chemical Industries Ltd., Nobel Division report; communication in the press.
(17) F. Krejci and L. Kacetl, *Chem. and Ind.*, 1957, **19**, 598.
(18) R. Belcher and M. K. Bhatty, *Analyst*, 1956, **81**, 124.
(19) A. I. Vogel, '*A Text-Book of Quantitative Inorganic Analysis*', Longmans, Green and Co., 1951, 505.
(20) M. Busch, *Ber.*, 1905, **38**, 861.
(21) L. W. Winkler, *Chem. Abs.*, 1921, **15**, 1296.
(22) H. Rupe and F. Becherer, *Helv. Chim. Acta*, 1923, **6**, 880.
(23) A. Arnaud and L. Pade, *Compt. rend.*, 1884, **98**, 488.
(24) H. Hartmann and G. Bäthge, *Angew. Chem.*, 1953, **65**, 107.
(25) M. Williams, *Ind. Chem.*, 1954, **30**, 594.
(26) J. Buckett, W. D. Duffield and R. F. Milton, *Analyst*, 1955, **80**, 141.
(27) R. C. Brasted, *Anal. Chem.*, 1952, **24**, 1111.
(28) I. M. Korenman and A. A. Belyakov, *Zh. Anal. Khim., SSSR*, 1954, **9**, 220.
(29) T. Mukoyama, *Japan Analyst*, 1956, **5**, 12.
(30) G. S. Deshmukh, *Z. anal. Chem.*, 1955, **145**, 251.
(31) L. D. Gluzman, and R. M. Tsin, *Zavod. Lab.*, 1956, **22**, 45.
(32) B. R. Sant, *Chem. Ber.*, 1955, **88**, 581.
(33) B. Suseela, *Z. anal. Chem.*, 1955, **145**, 175.
(34) G. S. Desmukh and M. K. Joshi, *Z. anal. Chem.*, 1954, **142**, 275.
(35) G. S. Desmukh and M. K. Joshi, *J. Indian Chem. Sci.*, 1954, **31**, 413.
(36) R. Belcher and A. J. Nutten, '*Laboratory Manual of Quantitative Inorganic Analysis*', Butterworths Scientific Publications, 1955, 201.
(37) A. I. Vogel, '*A Text-Book of Quantitative Inorganic Analysis*', Longmans, Green and Co., 1951, 375.
(38) J. Vulterin and J. Zyka, *Chem. Listy*, 1954, **48**, 839.
(39) B. R. Sant, *Z. anal. Chem.*, 1955, **145**, 257.
(40) R. Belcher and T. S. West, *Anal. Chim. Acta*, 1951, **5**, 546.
(41) B. Singh and K. C. Sood, *Anal. Chim. Acta*, 1954, **11**, 313.
(42) I. M. Issa and R. M. Issa, *Anal. Chim. Acta*, 1956, **14**, 578.
(43) D. D. Van Slyke and G. E. Cullen, *J. Biochem.*, 1914, **19**, 223.
(44) G. H. Buchanan, *Ind. Eng. Chem.*, 1923, **15**, 640.
(45) E. J. Fox and W. J. Geldard, *Ind. Eng. Chem.*, 1923, **15**, 743.
(46) R. Fosse, *Ann. Inst. Pasteur*, 1916, **30**, 525; *Ann. Chim.*, 1916, **6**, 77.
(47) V. C. Kiech and J. M. Lock, *J. Biol. Chem.*, 1928, **77**, 723.
(48) Imperial Chemical Industries Ltd., Nobel Division, Private Report.
(49) J. Bitskei, *Magyer Kém. Foly.*, 1956, **62**, 71.
(50) M. Rangier, and M. Krebs, *Bull. Soc. Chim. Biol.*, 1954, **36**, 1479.

Borax Used As Corrosion Inhibitor

RESEARCH carried out by Borax Consolidated Ltd. has shown that borax will protect non-ferrous metals from corrosion when they are immersed in aqueous ethylene glycol antifreeze solutions. Borax has been found to be effective in conditions which cause breakdown of other inhibitors.

This research, say Borax, has contributed to the preparation of draft BS CY(FHC) 5100 which is now available.

Borax is an anodic inhibitor and assists in the formation and preservation of a thin, invisible metal oxide film which is compact and adherent.

Both 20 Mule Team borax (decahydrate) and Neobar borax (pentahydrate) are soluble in ethylene glycol. The recommended quantity is 3 per cent by weight of ethylene glycol but the amount is not critical and can be varied without adversely affecting the protective action.

Developers for Colour Photography

A TYPICAL colour developer contains diethyl p-phenylenediamine hydrochloride; colour couplers react with the oxidised developer to give the dye images and the silver image is bleached out. This was stated by Mr. A. Marshall, Kodak Ltd., in a talk on colour photography that he gave at a recent meeting of the London section, Royal Institute of Chemistry, under the chairmanship of Dr. C. C. Hall.

Colour couplers which could be used to demonstrate the coupling reaction were: 2:5-dichloroacetoacetanilide for yellow, 1-phenyl-3-methyl-5-pyrazolone for magenta, and 4-chloro-1-naphthol for cyan. Couplers incorporated in the emulsion tend to wander into adjacent layers and this is overcome either by attaching a long chain hydrocarbon radical to the coupler or by dissolving the coupler in resinous or oily globules.

BY-PRODUCTS WILL CONTINUE VITAL TO GASWORKS ECONOMY

Review by NT By-Products Controller

AN overall picture of chemical by-products from gas was presented by L. W. Blundell, controller of by-products, North Thames Gas Board, at the annual meeting this week of the Institution of Gas Engineers. The author illustrated their key position in the gas industry's task of supplying fuel and chemicals essential to the industrial and domestic economy of the Nation. It is considered that although alternative sources of supply for the refined products may continue to be found, chemicals obtained from coal by traditional means will continue to maintain for many years to come their important position as an integral part of the economy of gas manufacture.

In discussing his subject, Mr. Blundell considered it in relation to the operations of the North Thames Gas Board. Treatment of the board's residual materials of carbonisation is carried out mainly at the Products Works, Beckton, on such a scale and extent that it presents a cross section of the chemical by-products industry as a whole.

Quantities Treated

Quantities treated annually at Beckton and Southall are as follows:

	Beckton	Southall
Crude tar (tons) ...	230,000	30,000
Crude benzole (gall.) ...	6,500,000	3,500,000
Crude ammoniacal liquor (gall.)	132,000,000	nil
Spent oxide (tons) ...	20,000	nil

Since the war years, much reconstruction of plant has been undertaken at Beckton in order to make good normal obsolescence and to meet the growing demands from the chemical industry for refined products. Beckton Gas Works supplies 40 per cent of the tar and liquor received at Products Works, Beckton, and 66 per cent of the crude benzole. The board treats nearly 90 per cent of its own production of crude tar, the remainder being sold to distillers under co-operative schemes. Crude tar at Beckton is stated to be substantially high-aromatic in character, and that of Southall mainly of the low-aromatic type.

In present refining operations at Beckton, mixed feed benzoles are distilled, mainly for the production of motor benzole. For chemical industry's requirements segregation of crude benzoles is necessary. When the forthcoming reorganisation of the refining plant at Beckton is carried out, there will be an opportunity for complete segregation.

Of disposal of ammoniacal liquor, Mr. Blundell said that as the NTGB's area is not well placed geographically, it is not possible to use the liquor by direct application as a fertiliser to the land. Only 1½ per cent of the board's production is disposed of in this way. Almost all ammoniacal liquor produced in the board's area is taken for centralising treatment to Products Works; 7 of the 18 manufacturing stations concentrate their liquor before despatch.

The acid plant at Beckton consumes about 50 per cent of the sulphur extracted in the board's oxide purification processes. Sulphur is also obtained from the exit gases from the sulphate of ammonia saturators and is converted by the contact process. The tonnage of acid produced is stated to be more than sufficient for the board's needs.

A substantial quantity of carburetted water gas tar (of the order of 4 to 5 million gall. per annum) is produced. At present it finds its main use as liquid fuel for steam raising at a number of the board's stations; some is disposed of by direct sale. Recently, this gas tar has assumed much greater significance as a source of industrial pitches and other valuable products. More than 1 million gall./annum are being distilled for the production of a special pitch required in the manufacture of pigmented flooring tiles.

Brief mention is made of the production of tars as by-products of catalytic oil-gasification processes, such as the Onia-Gegi and Segas processes. The tars produced are of the high-aromatic type and have a high free carbon content. Tar distillers will therefore have interesting new sources of crude tars which will partly compensate for any reduction in the output of coal tar from traditional coal gas plant.

Tar Distillation

Tar manufacture: The Beckton plant consists of two continuous pipe-still fractionating units (one of Koppers design, the other Koppers-Woodall-Duckham) each capable of distilling 400 tons of crude tar/day and a pot still having a capacity of 350 tons of crude tar/day. The Southall works uses three pot stills of 30 tons capacity each. Mr. Blundell reported that the continuous units have the great advantage over pot stills in producing cleaner-cut fractions with practically no overlap, except in the heavier ranges. Working conditions are cleaner and manpower required is half that required on the pot stills. Over two-thirds of the tar is distilled in the continuous units.

Tar products recovery: Annual production of crude phenols at Beckton is about 2 million gall., of which 80 per cent is derived from tar and 20 per cent from ammoniacal liquor. Crude phenols are removed from other oils by a batch process, but replacement by further continuous units is now being considered, Mr. Blundell reported. The plant will process 2,500 gal./hour of phenate solution yielding 7,000 gall. of crude phenols/day (phenol, 21 per cent; cresols, 37 per cent; xylenols, 26 per cent, and water, pitch, etc., 16 per cent.).

In 1955 one APV continuous fractionating plant was commissioned capable of treating up to 2.5 million gall. annually. Last year, total production of refined phenols was 1.5 million gall. In the fractionating columns in the plant, corrosion difficulties have been encountered. Because of the high cost of stainless steel and nickel, mild steel storage vessels, with synthetic resin linings have been installed.

Presses for naphthalene are reported to be costly to maintain and the life of the high-pressure cylinders is uncertain. Failure is stated to be due to porosity in the casting. The plant also has a Krauss centrifuge capable of producing about 1 ton/hour of whizzed naphthalene of lower crystallising point. Experimental work is now in progress on the up-grading of material produced by centrifuge and to find a replacement for the old crystallisers. Greatly increased demand for semi-refined naphthalene for phthalic anhydride manufacture has caused the output of pure white acid-washed naphthalene to fall in recent years.

Recovery of Pyridine

Pyridine bases are recovered from light tar distillates. Pyridine acid is neutralised continuously with ammonia, to release the crude bases, as described in patent B.P. 749372. Refined bases are produced as pure pyridine, α-picoline, β-γ-picoline, 90/100 bases, 90/180 bases, etc.

Ammonia recovery: The more profitable section of the treatment of ammoniacal liquor is dephenolation. The dephenolation plant has been in continuous operation for the last 17 years, and a total of 1,600 million gall. of ammoniacal liquor has been treated, yielding over 5 million gall. of crude phenols, which has not only contributed to the economics of the process but has reduced the cost of disposal of the spent liquor. The liquor usually contains 0.2 to 0.4 per cent phenols and a 90 per cent removal of phenols is normally obtained. The crude phenols yield about 40 per cent phenol, 40 to 45 per cent of cresols, 5 to 10 per cent of xylenols, and 10 per cent of pitch.

It is reported that while the maintenance costs of the Holley-Mott washer have been extremely low over a long period of operation, its capital cost and space requirements have prompted examination of other methods.

The process for ammonia recovery has remained substantially the same as that practised in 1879. However, mechanised plant and large units have been introduced. The present plant consists of two units and is capable of treating 10,000 gall. of liquor/hour. The distillation tower of a third unit has been in operation since 1954. The third unit will be completed by the installation of continuous centrifuges instead of the present batch machines, which have proved costly in maintenance.

Materials of construction were mentioned by Mr. Blundell as a most important factor in successful operation of by-product liquor treatment plants, since corrosion is severe. Cast iron or mild steel has been found satisfactory for distillation towers and storage tanks, and aluminium for constructional work. Lead is required for hot acid conditions, preferably with a tile lining to withstand the abrasive effect of sulphate crystals. Haubold centrifuges are

constructed with baskets of phosphor bronze and Monel metal, with rubber-lined cast-iron casings and stainless-steel knives. New centrifuges will be fabricated from stainless steel.

Sulphuric acid: As the raw material for sulphuric acid is spent oxide (containing 50 per cent free sulphur), a chamber plant has been used for acid production. After the second world war the original plant was replaced by a Mills Packard water-cooled chamber plant (installed in 1952). This plant has fulfilled expectations in so far as labour costs and maintenance charges are low and because of increased intensity at operation, capital outlay is lower per unit of acid produced.

Between 10,000 and 11,000 tons of spent oxide per annum are burnt at this plant which produces 16,000 tons of sulphuric acid (100 per cent) a year. Further extension of acid-manufacturing plant is planned to replace the older chamber plant which is still producing 8,400 tons of acid (100 per cent)/annum from spent oxide and surplus ammonium sulphate saturator exit gas. An intensive chamber plant is preferred to a 'tower' plant.

In 1937 a wet contact plant was installed to utilise the hydrogen sulphide content of the ammonium saturator gas. A vanadium pentoxide catalyst is used. The first unit has produced very pure 93 to 95 per cent sulphuric acid at the rate of 3,000 tons (100 per cent)/annum for 21 years. Because of the economic advantages of disposing of saturator exit gas in this way, a second identical unit was installed in 1952.

Eighty-seven per cent of the acid produced at Products Works is consumed in the board's processes. The spent oxide containing 50 to 60 per cent ferric oxide no longer presents a disposal problem. About 18 per cent is used for manufacture of artificial purifying material for use in place of, or in conjunction with, bog ore, and the remainder is sold.

Effluent treatment: The old settling beds have been replaced by a semi-automatic mechanised effluent reception plant designed to guarantee substantial freedom of the effluent from solids and liquids. The new plant (in operation since September last year) has a reception tank of 260,000-gall. capacity, and at normal rate of flow thus allows effluent to remain in tank for about 6 hours, while oil and scum separate, and solid matter is deposited as sludge. Sludge, scum and oil are removed by mechanical scrapers to hoppers, from whence they are pumped away for disposal. Clear effluent is pumped to the sewer. The principal problem is the disposal of sludge from the process. It is of buttery consistency, markedly thixotropic, and contains up to 95 per cent water, the solids being mainly chalk with entrapped oil globules. At present it is discharged into lagoons from which water evaporates, leaving a solid residue for disposal.

By-products research: Current research being carried out is on physical methods for removal from crude coal tar of aqueous liquor containing ammonium chloride. Other projects include the physical and the chemical separation of pure benzene, and the purification of naphthalene and of sulphur from the solvent extraction of spent oxide.

'No Discrimination Against Women'

CHEMISTRY as a career offered opportunities not only for the brilliant but also for the 'good B+ types'; there was no discrimination against women and an added advantage was the trend to appoint the technically qualified to managerial posts. These points were emphasised at a recent 'Careers in chemistry' forum held by the London section, Royal Institute of Chemistry, at Battersea Grammar School.

The headmaster welcomed the panel of six speakers under the chairmanship of Dr. C. Simons; Dr. H. J. Barber, industry, Dr. J. Idris Jones, Government service, Dr. J. H. Pryor, teaching, Dr. Joan A. Reid, careers for women, Dr. C. W. Herd, consultants, and Dr. Kenneth Pankhurst, research associations.

A large number of questions was put to the panel and they covered a wide range of subjects, which fell into fairly well-defined groups.

(1) Requests for the type of qualification needed for entry into any particular branch of chemistry. There was some vagueness about the various routes to graduate qualifications, but the panel agreed that full-time study was preferable. The girls were particularly interested in careers in biochemistry.

(2) Details of remuneration.

(3) Prospects of reaching 'managerial positions'. It was pointed out that technical qualifications were not enough and that personal qualities, such as initiative, social attributes, etc., were all of importance.

(4) Specialisation. The panel was unanimous that specialisation should be left until the latest possible time; for a graduate, when he started his first job. It was felt that the teaching of principles and their application should receive priority.

(5) Opportunities overseas. While it often seemed that monetary rewards were better overseas, there were great opportunities in the UK to those with ability, initiative and perseverance.

Electronics Monitor a Safe Wigner Release

FULL instrumentation contributed to the safety of the recent successful release of Wigner energy on the BEPO reactor at Harwell. On BEPO, a battery of 75 electronic recorders, many of which were manufactured by Honeywell-Brown Ltd., maintain continuous graphs of temperatures in all parts of the reactor. UK Atomic Energy Authority requirements for 10 special recorders were met by the company in under a month

The release, periodically necessary to restore the effectiveness of the graphite moderator, was initiated by slow heating of the graphite. It was partly faulty instrumentation during a Wigner release that led to the Windscale accident.

Progress Report on Wimpey Contracts

REVIEWING the activities of George Wimpey and Co., for the year ended 31 December, 1957, Sir Godfrey Mitchell states that in the civil and engineering development field, the contract for Associated Ethyl Co. Ltd's factory at Ellesmere Port was successfully concluded. The company have since been entrusted with further extensions at Ellesmere Port. The work on the Widnes factory of A. Boake Roberts and Co. Ltd. is nearing completion.

Imperial Chemical Industries Ltd., have awarded Wimpey's a large contract for ICI's new Terylene plant.

British Oxygen Wimpey Ltd. (joint company of Wimpey and British Oxygen Co.) are reported as having pressed steadily forward throughout the year on the special rocket project they are constructing for the Ministry of Works in Cumberland.

The mechanical and engineering departments completed their work on the polyethylene plant at Grangemouth for Gemec Ltd. (Union Carbide Ltd.). This is stated by Wimpey to have gone on stream in December 1957. The same clients have entrusted Wimpey with a similar project at Fawley, where they will carry out work on a £3 million factory for the manufacture of ethylene oxide and its derivatives.

At Partington, Wimpey announce that they are constructing ethylene oxide and oxygen plants for the Lummus Co., on behalf of Petrochemicals Ltd. They have also been awarded a 'substantial' contract for the construction of the low-pressure polyethylene, cumene and phenol plant at Grangemouth for E. B. Badger and Son on behalf of British Hydrocarbon Chemicals Ltd.

Further Reductions in Platinum Prices

As a result of sharply reduced demand from the chemical and electronic industries and weakness in foreign markets, the official US price of platinum has been cut by $5 per troy ounce. The new prices are $70 for small lots and $67 for large.

In the UK, Johnson Matthey and Co. have further reduced the price of South African platinum from £26 15s to £25 per troy ounce.

Rustenburg Platinum Mines, the South African producers, report that they have now reorganised their operations. Production is 'somewhat lower' than the present estimated volume of sales in the current financial year to 31 August next, which remains at approximately 50 per cent of that achieved in the financial period 1956–57. The company hopes that existing stocks of platinum will now gradually be reduced.

US industry sources say that Russian sales and offerings by companies that probably have taken platinum in barter deals have contributed to the heaviness of the market.

Overseas News

NEW DEVELOPMENTS IN JAPAN'S PETROCHEMICAL INDUSTRIES

IN 1957 Nippon Petrochemical Co. commissioned their first petrochemical units at Kawasaki with capacities of 2,000 tons isopropylalcohol and 3,500 tons of acetone. This year further units are to be brought into commission and this first expansion phase is expected to be completed by spring 1959.

It is expected that in due course production will be 25,000 tons ethylene, 19,000 tons propylene and 5,200 tons butadiene; also, methane (no quantity stated) and cracked fuels with octane rating of about 90. Production will be based on refinery by-products from the parent company—Japan Oil Co. (Nippon Sekiyo Seisei).

Ethylene will go to Showayuka Co., and Furukawa Chemical Co., for polyethylene production and to Nippon Shokubai Kogyo for the preparation of ethylene oxide and ethylene glycol. Propylene will go to the Nitto Chemical Co., and to Ashai Denka for butadiene whence it will pass to Japanese Geon Co. for synthetic rubber production. Methane will be used by Showa Denko KK for fertiliser manufacture.

Nissen Chemical Industries Ltd., Tokyo, are to enter the petrochemical field. They will follow Toyo Gas Chemical, Toyo Koatsu Co., and Shinetsu Chemical Co., and will base their petrochemicals on natural gas. The basic material will be supplied by Kyoei Kogyo who will set up a joint company to exploit natural gas reserves near Niigata. The joint company will have a capital of 500 to 800 million yen (£500,000 to £800,000).

First phase of the petrochemical production will be based on the natural gas output of 120,000 cubic metres. The yearly output of polyvinylchloride will be 9,560 tons and 17,000 methanol. It is expected that later on 400,000 cubic metres daily of natural gas will be available when additional chemical plants will come into operation; thus a 33,000-ton a year urea and ammonium sulphate plant, an acrylonitrile plant with a capacity of 10,160 tons a year and an acrylic ester plant with an annual capacity of 6,600 tons. Finally, under licence from Montecatini, of Italy, polypropylene production is to be taken up.

Canadian Du Pont Report Higher Sales in 1958

Sales of Du Pont Company of Canada in the first quarter of 1958 are running at a higher level than a year ago, largely due to the addition of new products. The company's newest plants have not yet reached a profitable level of operations. Earnings, while comparing favourably with the last half of 1957, are lower than the corresponding period a year ago.

New developments include a technical service laboratory for polyethylene to be built at Kingston at a cost of about $300,000, and the impending start-up of a new hydrogen peroxide plant at Maitland, which provides manufacture by a new 'economical chemical process rather than by the traditional electrolytic route'. In the last 18 months, the company has spent $12 million on expanding nylon production facilities.

Du Pont of Canada have set up a special plastics division within the company to boost their participation in the fast-growing Canadian plastics industry. One of the main functions of the division will be to develop markets for high density polyethylene.

Shell Saint Gobain Increasing Production of Solvents

Under an expansion programme in the petrochemical field, Société Shell Saint-Gobain (subsidiary of Saint Gobain and Shell Française) increased production in 1957 of C_3 solvents such as isopropylalcohol, acetone and derivatives thereof to 19,000 tons. In 1956, 13,700 tons C_3 solvents were produced.

This year, the company will produce C_4 solvents (secondary butyl alcohol and methyl ethyl ketone) which were previously imported. A new plant to make C_4 solvents came into production on 30 December 1957.

India to Manufacture Carbon Black

By invitation of the Indian Government two Rumanian experts are to explore the possibilities of manufacturing carbon black in India. Its manufacture by utilising coal-tar fractions in consultation with a German concern is also being explored. It is also reported that an Indian industrialist is also negotiating with a leading US company for the same object.

Black Polyethylene for Chemical Ventilation Systems

Ventilation systems for laboratories, which will withstand corrosive fumes without deteriorating or discolouring, are now being fabricated completely of black, all-weather polyethylene according to US Industrial Chemicals Co., New York, US. Polyethylene compound with carbon black is expected to give 15 to 20 years of service and it is therefore suggested that its substitution for metal should reduce maintenance and replacement problems substantially on fume hoods, exhaust stacks, fans and fittings.

New Jap Polyethylene Units on Stream

Mitsui Petrochemical Industries Ltd. officially brought their $30 million complex at Iwakuni on stream last month. Polyethylene production is stated to be under way at a rate of 1,000 tons a month. The complex has the following units: catalytic reformer, Udex (aromatics), ethylene cracking and separation, Ziegler polyethylene (12,000 tons a year), ethylene oxide (6,000 tons), ethylene glycol (4,800 tons), cumene, phenol (12,000 tons), acetone (7,000 tons) and terephthalic acid. Practically all the process know-how has been provided by Scientific Design Co. Inc., and Stone and Webster who designed some of the units.

Also due on stream is the polyethylene plant of Sumitomo Chemical Co. Ltd. Initial output is put at 150 tons a month; this will be worked up to 1,000 tons a month.

Carboxymethylcellulose Production in Italy

According to data compiled by *Aschimici*, the following Italian companies are engaged in the production of carboxymethylcellulose: A. E. Bianchi (Rho), Barzaghi (Milan), Cesalpinia (Milan), Lamberti (Albizzate), Giudicel (Bergamo), Montecatini (Milan).

Their joint output totals about 2,000 to 2,200 metric tons a year (reckoning in terms of 100 per cent CMC). About 2,200 to 2,400 yearly tons of carboxymethylcellulose is consumed in Italy, and the difference is imported mainly from West Germany, Holland, Sweden and the US. The product is utilised for the following purposes: production of detergents, 60 per cent; textile industry 20 per cent; ceramic, etc., industries, 10 per cent; mining industry, 6 per cent; pharmaceutical and cosmetics industries, 1 per cent; miscellaneous uses (photography, foodstuffs, etc.), 3 per cent.

Pharmaceutical Developments in Brazil

Merck, Sharp and Dohme, US, have established a new factory in Campinas, in the State of Sao Paulo, to produce pharmaceuticals, vitamins and allied products. Another US pharmaceutical manufacturing company, Stafford Miller International, are reported to be considering expanding their activities to Brazil.

Hoechst PVA Plant for Durban

A plant for the production of polyvinyl acetate dispersions is to be set up by Farbwerke Hoechst of Germany at Durban. The vinyl acetate required for polymerisation in the new plant is to be supplied from Hoechst works in Germany.

Hoechst Interest in Austrian Polyethylene Project

Under an agreement between the Austrian Mineral Oil Co. and Farbwerke Hoechst a petrochemical plant is to be erected adjacent to the Schwechat refinery, at present being built by Austrian Mineral Oil Co. The plant is scheduled for completion in 1960.

Terms of the agreement are that the Austrian company will supply about 3,700 metric tons of ethylene produced at the Schwechat refinery to the plant for pro-

cessing into polyethylene. This will be supplied in lieu of payment of 60 million schillings (about £850,000) for the gas separation plant to be supplied by Hoechst to the refinery.

It is also reported that an agreement for the production of propylene is being prepared between the Oesterreichische Stickstoffwerke (Austrian Nitrogen Works), of Linz and the Montecatini group of Italy.

Forming Fibres by a New Method

A relatively new method of forming fibres by a 'reaction spinning' process has been outlined by H. Pohl, plastics laboratory, Princeton, New Jersey, US. The process has been used to make silicone, phenol-formaldehyde, polyacrylic acid, polystyrene and polyurethane fibres.

A chemical reaction is used to 'firm' up the fibre after it is extruded through a spinneret. Incompletely polymerised or incompletely solubilised polymer is forced through the spinneret at a rate, temperature, etc., that causes it to set to a solid or semi-solid fibre. This is then taken up on a wind up package where further reaction takes place. The aim of this research worker is to produce novel fibres featuring high insolubility or high temperature stability.

US Rubber Licences for French Company

Eugene, a leading French chemical company, has signed an agreement with United States Rubber Inc. for production of special rubbers, latex and plastics materials from a butadiene base in France. US Rubber have sold exclusive licences to Eugene for use of its production techniques and is to help in the construction of a factory.

No details are available of the financial arrangements involved in the deal. It is reported, however, that the arrangements will mean a substantial saving in foreign currency, as French imports of butadiene products are stated to cost $4 million a year.

US Cyanamid Plan New Maleic Anhydride Plant

American Cyanamid Co. will build a 'multi-million dollar plant' at Bridgeville, Penn., for the production of maleic anhydride. Initial capacity will be for 14 million lb. a year. Operations are scheduled to begin late in 1959.

Natta on Elastomeric Olefinic Isomers

At the 133rd American Chemical Society meeting, Professor Giulio Natta reported on elastomeric olefinic isomers. This work is now in pilot-plant development. A 1-4-*trans*-polybutadiene fibre is stated to behave in a manner similar to muscle proteins. When the length of the fibre is reduced, it changes from one crystalline form to another. The *cis* form of the isomer is reported by Natta as duplicating many of the properties of natural rubber; it is now being evaluated in road tests.

Amorphous copolymers of ethylene and propylene (proportion of either ranging from 25 per cent to 75 per cent) were reported. These, Natta claims, show good resistance to ageing and have a greater tensile strength in the vulcanised state than has natural rubber; also this tensile strength is generally better than that of GR-S polymers. However, the copolymers are apparently not so tough as the polybutadienes.

The professor also mentioned briefly work on polystyrene and on crystalline vinyl polymers containing silicon, tin, oxygen or halogen substituents.

Carbide Chemicals Increase Polyethylene Production

A project to raise polyethylene production capacity by 12 million lb. a year is under construction at the Montreal East plant of Carbide Chemicals Co. Scheduled for completion in April 1959, the project will increase the plant's capacity to 40 million lb. a year.

Polyethylene consumption in Canada in 1957 was 34 million lb., a 50 per cent increase on the previous year. A consumption of 50 million lb. is forecast for 1958.

Korea to Buy West German Fertiliser Plant

The Government of Korea and a West German combine have signed a contract for the construction of a urea fertiliser plant at Naju in south-west Korea. Annual production will be 85,000 tons and the plant is scheduled for completion by the end of 1960. Construction, which will be financed by Government funds, is expected to cost US $23.5 million plus Hwan 2,500 million for local expenses.

Chemstrand Earnings Improve

Profits of Chemstrand Corporation, US, jointly owned by American Viscose and Monsanto Chemical, are expected to recover sharply in the second quarter of 1958 compared with the first. First quarter earnings were $1,885,000; operations picked up in April and continue to improve.

American Viscose had first quarter earnings of 13 cents per share, against 85 cents in corresponding 1957 period. Mr. W. H. Brown, American Viscose treasurer, told the annual meeting that he hoped the company would receive a dividend from Chemstrand before the end of 1958; at present Chemstrand are prevented from paying dividends under a bank loan restriction.

Chemicals 'Made' in Canada

A list of chemicals and drugs covered by tariff items 216 and 208t, which are at present considered to be 'made' in Canada, is contained in the *Board of Trade Journal* for 9 May, p. 1116. The information was obtained from the Canadian Department of National Revenue memorandum series D51-33.

Roche to Supply Drugs to Colombia

The Roche Co., Switzerland, are reported to have arranged with the Government of Colombia, South America, for the import into Colombia of $600,000 of antibiotics and other medical supplies, in exchange for coffee of an equivalent value.

Hydrogen Contract for New US High Energy Fuel Plant

A contract to design and build a plant to supply hydrogen for a new $45 million high-energy fuel plant has been awarded to Girdler construction division of Chemetron Corporation. Olin Mathieson Chemical Corporation, who are building the plant for the Air Force at Model City, New York, said that the subcontract calls for a high-purity hydrogen plant, plus related dehydration and compression facilities.

The contract represents Girdler Construction's third hydrogen plant for the US high-energy fuel programme. A Girdler-built plant now supplies hydrogen for the sodium borohydride plant recently completed by Metal Hydrides Incorporated at Danvers, Mass. The other is being built for the Navy's new $38 million Hical high-energy fuel plant under construction by Callery Chemical Co. at Muskogee, Oklahoma.

US Work Produces Durable Coatings from Vegetable Oils

NEW hard, durable coatings for tin cans, concrete and industrial equipment have been made from linseed and soyabean oils, Dr. H. M. Teeter of the US Department of Agriculture's Northern Regional Research Laboratory, Peoria, Illinois, reported at the 133rd ACS meeting. The coatings are stated to have unusual adhesion to metals such as black iron and aluminium, while being flexible and resistant to abrasion and stain by harsh chemicals. Adherence was so strong that discs stamped from metal covered with the new coatings were formed into lids and then crimped into place on the can body without any breaks in the film.

The vegetable oils were treated with sodium to convert them into fatty alcohols. The alcohols were treated with acetylene which changed them to vinyl ethers. Molecules of the vinyl ethers were then linked together in a polymerisation process to obtain the new coating materials. According to Dr. Teeter, to prepare coatings with a wide variety of properties, the new fatty materials may be mixed with other vinyl ethers before polymerisation. Some coatings may need to be baked to form films. Others will dry hard at room temperature, and still others may form films upon baking, without adding metallic driers or even in the absence of air.

These films also hold promise as industrial finishes for maintenance purposes, as primers for concrete and masonry, and as adhesives.

EQUIPMENT REVIEW

Chemical Plant: Laboratory Apparatus Safety and Anti-Corrosion Products

NEW FLUID ENERGY MILL

THE NEW Russell fluid energy mill, which operates on a new principle and is claimed to handle an 'almost indefinite range of materials,' has been introduced by Russell Constructions Ltd., Russell House, 8 Adam Street, Adelphi, London WC2. The mill, it is said, will reduce down to below 10-5 microns at a rate of 15 cwt. per hour such hard substances as coarse slate chippings. Crystalline materials such as sugar are reduced to below 15 microns at rates of 1-1½ tons per hour. In contrast, pliable or fibrous matter such as oatmeal, is pulverised down to below 120-200 mesh at outputs ranging up to 9 cwt. per hour.

Mechanically induced turbulences are caused in an air stream carried through the mill chamber. This instantly accelerates the particles up to supersonic speeds at which point they either disintegrate on collision, or the particle structure itself will 'blow apart.' Two models are available, a 50 h.p. unit for very high capacity applications and a small 15 h.p. machine which gives the same quality of product with lower outputs.

INDUSTRIAL LEVEL CONTROLLER

AN INDUSTRIAL level controller of a new type has been introduced by J. Edward Hall (Elec. Engineers) Ltd. Clarence Road Works, Leeds 10. Known as the Proxicon Mark III, it is designed to control the levels of any liquids or free-flowing solids without necessitating direct contact with the material, and without any moving parts in the container.

Proxicon remote level controller for single level applications

With the addition of tapped electrode terminals, remote control can be extended up to 3,000 feet using standard types of cable. Sensitivities greater than 1.0 pf are claimed under all conditions subject to variations of not more than ± 0.25 pf with mains variations of 5 per cent to −7½ per cent and not more than ± 1 pf with temperature variation of ±20° F from a 68° datum figure, The equipment has been designed so that consistency of operation, one instrument with another, is guaranteed. It can be supplied for single and dual level applications, voltage ranges 100/125, 200/250 and 360/450 volts, 40-60 cycles. Three voltage tappings are incorporated for each range for exact site voltage to be selected.

Electrodes are available to meet all applications and can be supplied with the instrument which costs from £41 per level point, complete with control, electrode and signal station units.

ELECTRO-OPTICAL BALANCES

A SWISS-MADE range of electro-optical balances has been recently introduced to this country. Mikrowa balances are now available from Optimec, 3 Westhead Chambers, George Street, Staines, Middlesex, for laboratory use. Features of these balances are a scale length of 2.5 metres with a graduation interval of 2.5 mm. Counterweights up to the maximum bearing capacity are only necessary from 50 or 100 grammes onwards. Results can be read off within 3 to 5 seconds because of rapid-action oil damping and a simple braking mechanism is fitted for non-fluctuating recording of results. The company claim that their balances offer 10mg. accuracy for a bearing capacity of 2 kg.

GAS LIQUID CHROMATOGRAPH

W. G. Pye and Co. Ltd., of Cambridge, have developed a new type of gas liquid chromatography equipment capable of high resolution and extreme sensitivity, the company state. It is designed to take up to 4 metres of column, although for most analyses a single metre column of 3,000 plates is more than adequate to separate the components of the sample under test.

A katharometer is used as a detector—the overall sensitivity of this system being improved by as much as forty times by means of the low noise d.c. amplifier connected between the katharometer bridge and the recorder. Switches are provided to change the sensitivity during a run by factors of 2, 5 and 10 over a wide range—from 100 millivolts to a maximum sensitivity of 12.5 microvolts full scale deflection on the potentiometric recorder. Under favourable conditions 1 microgram of a component in 1 millilitre of carrier gas gives full scale deflection, the company state.

Good temperature and pressure control ensures stability at such high sensitivity. In the range 50-250°C the katharometer temperature is controlled to within 0.05°C and the column within 0.5°C. The control of pressure and flow is so designed that any disturbance affects both cells of the katharometer at the same time for maximum compensation.

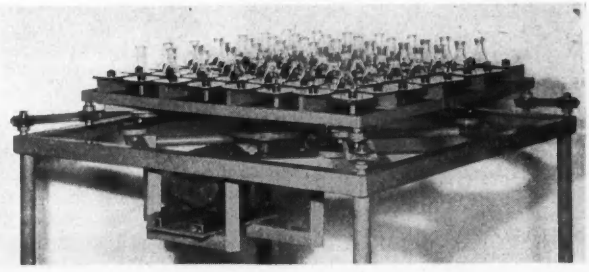
The apparatus is contained in a trolley mounted cabinet.

AIR OPERATED STIRRER

AN AIR operated stirrer has been added to the range of portable type stirrers made by the Kestner Evaporator and Engineering Co. Ltd., 5 Grosvenor Gardens, London SW1. It is additional to those operated by a totally enclosed or flameproof type of electric motor. The prime mover is a rotary vane air motor suitable for working pressures of up to 90 p.s.i. with integral sun and planet reduction gear driving a stainless steel, or plastic coated, shaft which is fitted with two opposed propellers. Small size, light weight and flexibility through the air control, which provides variable speed operation, is claimed for the stirrer.

ROTARY LABORATORY SHAKER

A LABORATORY shaker designed to give a rotary shaking action to flasks has been produced by Apex Construction Ltd., 15 Soho Square, London W1. Model 223A laboratory shaker is designed to take 49 250 c.c. flasks. These flasks are mounted in a wooden board, the flasks being held by rubber and aluminium discs which are secured by wing nuts. The board rests on four steel balls which themselves rest in concave housings on the tubular floor standard and it is held in position by springs at each corner. Each spring is held by two small pulleys, one of which is attached to the board and the other is



Apex rotary laboratory shaker

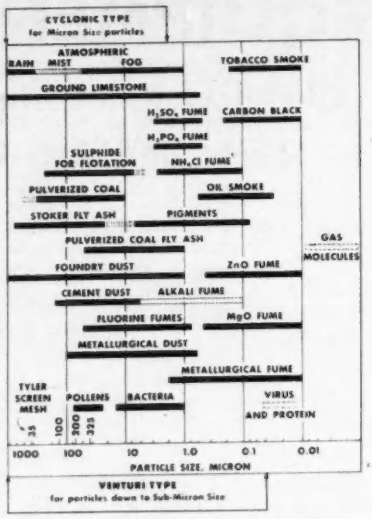
attached to the floor stand.

The shaker is driven by a ¼ h.p. 400/3/50 motor and gear box and there is a vee belt drive to a pulley mounted centrally on the stand. The board is mounted on to this pulley by means of an eccentric mechanism which has an adjustment between ¼ and 2½ in. The final speed obtainable on the pulley is 100 or 160 r.p.m. and change of speed is effected by change of motor pulley.

PEASE-ANTHONY GAS SCRUBBERS

THE Pease-Anthony cyclonic scrubber and the venturi scrubber, already used in industries in the US for the removal of micron and sub-micron dusts, fumes, mists and fogs from gas streams, is now available in this country from Chemical Construction Ltd., Bush House, London WC2. The apparatus is effective for the reduction of air polution and for cleaning industrial gases; it also enables metals and chemicals to be recovered.

Dirty gas enters tangentially at the bottom of the cyclonic scrubber and pursues a spiral path upwards. Spray is introduced into rotating gas from an axially-located manifold in the lower part of the unit. The fine spray droplets are caught in the gas stream and by centrifugal force are swept across to the wall of the cylinder, colliding with and collecting the dust particles on route. The water and collected dust run down the walls and out at the bottom of the unit. The cyclonic scrubber is suited to the removal of dusts and mists of micron size when it will give very high removal efficiencies often above 99 per cent, with small pressure losses and consequently low power requirements, the company say. The water requirements are low, normally between 4 and 8 gallons per 1,000 cubic feet of cleaned gas; the actual quantity varies with the dust particle size and inlet gas temperature. No moving parts are used and corrosion-resistant materials virtually eliminate maintenance problems.



Partical size range covered by Pease-Anthony gas scrubber

In the venturi scrubber dirty gas at high velocity impinges upon and atomises a curtain of liquid introduced through jets at the throat of the venturi. Differential velocities of gas and atomised liquid result in collision of mist or dust particles with liquid droplets. The coalescence of mist or agglomeration of dust resulting from this collision make simple cyclonic separation possible. A pressure loss of 10 to 15 inches water gauge is often ample, which in terms of power is about 2.2 to 3.5 h.p. for 1,000 c.f m. of cleaned gas. Coarser dust requires less power; finer fumes and some mists require more. High temperatures present no difficulties and the use of corrosion-resistant materials and no moving parts results in low maintenance costs, the company say.

NEW ACID-RESISTANT BUCKET HAS FOUR LIPS

An industrial bucket with a specially reinforced steel handle, polyethylene coated for acid resistance, and four pouring lips, has been made by British Xylonite Co. Ltd. It is a new addition to the Bex range, is made in industrial grade polyethylene and holds 15 litres (three and a quarter gallons).

WATER TESTING KIT

A NEW water treatment control testing kit has been produced by Albright and Wilson Ltd., 1 Knightsbridge Green, London SW1, that enables control tests to be made easily and quickly on different types of water. The results obtained using this kit are claimed to be adequate for the great majority of water treatment control purposes, although slightly less accurate than those obtainable under closely controlled laboratory conditions.

It can be used for the control of water treatment for steam boilers, including those where phosphate conditioning is employed, as well as for checking water softener efficiency and testing water in recirculated cooling water systems.

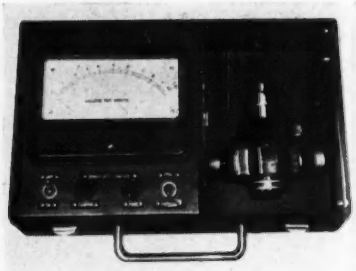
Raw and softened waters can be tested for total hardness, alkalinity to phenolphthalein and methyl orange, and chloride concentration. Boiler water tests include total and caustic alkalinity, chloride and phosphate concentrations.

In a lightweight transparent plastic case, the kit includes all necessary apparatus, together with polyethylene bottles containing reagents. The kit, complete with apparatus, an initial supply of reagents and full instructions for use, costs £12.

HIGH PRESSURE FLOWMETERS

A RANGE of high pressure flowmeters, capable of handling from 0.5 to 300 g.p.m., has been developed for use with a wide variety of chemical fluids by the Technical Developments Division, Gloster Aircraft Co. Ltd., Gloucester.

The flowmeters are normally supplied calibrated to their own indicators and they may be portable or panel mounted. The metering unit comprises a main body in which is housed a tapered sliding plug held in the closed position in a sharp-edged orifice by a main control spring. Fluid passing through the meter overcomes the spring force, displacing the plug as a function of flow.



Portable indicator and flowmeter, type TDD 101/1 and 2

Linearity is achieved with a suitable combination of initial spring load, spring rate and plug taper. Movement of the plug is transmitted to the indicator unit by a potentiometer (the slider being lightly spring loaded against the plug spindle), through a direct current balanced bridge network. An alternative method of transmission, using an induction pick-off, which can be provided in place of a potentiometer, enables the flowmeter to be used with non-compatible fluids.

GAS INDICATOR RANGE

SMALL portable instruments which compare a gas mixture under test in one chamber with a reference gas (usually air) in the other chamber by interferometric method, are now available for sale in this country. The instruments are very simple and measure with laboratory accuracy to sensitivities of 0.1 per cent, 0.02 per cent, 0.005 per cent.

They are known as the RJ gas indicator

range and may be obtained from Joberg Ltd., 33 Barbican, London EC1.

The air to be tested is sucked into the sampling chamber through a filter by squeezing a rubber aspirator and the percentage of the gas of interest is read directly off a scale visible through the eyepiece. The procedure is repeated for further tests.

Because the instrument uses the principle of index of refraction it is possible to measure a great range of combustible and toxic gases with consistent accuracy, the company state, including methane, petrol vapour, hydrogen, Freon, carbon dioxide, Trilene, etc.

LIGHTWEIGHT PROTECTIVE CLOTHING FEATHERWEIGHT p.v.c. materials are now used extensively by Timeg Ltd., 102 Wardour Street London W1 in the manufacture of their range of protective combination suits, coats, jackets, aprons, trousers, gloves, and head gear. These garments are made of superior quality pvc coated on a combined nylon and cotton base, triple French stitched and electronically welded. This ensures a waterproof garment with invisible seams that is light in weight, comfortable and hard wearing, the company state.

Another range of protective clothing made by Timeg Ltd., is featherweight neoprene garments manufactured from a nylon or Terylene base sprayed with neoprene and sewn with a special Terylene thread. These garments are specially treated to give protection against dangerous chemicals, fumes, petrols and oils.

INDUSTRIAL and LABORATORY VISCOMETERS THE RANGE of viscometers being made by Short and Mason Ltd., 280 Wood Street, London E17 is intended for most purposes, from small laboratories to the automatic control of viscosity in complex industrial systems. Viscosity can also be continuously recorded with these instruments.

Industrial models include provisions for measuring liquids under high pressures at high temperatures; and dipping measuring systems are available for use with open or closed tanks. A multi-speed laboratory viscometer with five interchangeable measuring systems from 0.025 centipoises to about 1300 poises is known as the Rheomat 15. For non-Newtonian liquids, a plotting template is included to enable the rheograms of the substance under test to be obtained. The laboratory viscometers are considered suitable for field use, and can be supplied fitted into a portable case.

PLASTICS-LINED RUBBER HOSE A POLYETHYLENE-LINED rubber hose for the conveyance of concentrated mineral acids has been developed by Dunlop Hose Division, Team Valley Trading Estate, Gateshead, under the trade name of Valithene.

Applications for which the hose is considered suitable include: temporary pipe lines; lead pipe replacement in chemical plant; chlorine water plant pipes; pipe lines for dyestuffs; pharmaceutical and fine organic chemical plant.

Sizes in which the hose is available range from ¼ in. to 3 in. bore, and lengths of up to 60 ft. can be supplied. Working temperatures should in general not exceed 60°C, although very low pressure steam may be used for cleansing, provided that the other end of the hose is open to the atmosphere. Maximum working pressure is 50 lb. p.s.i.

NIFE LIGHTING HARNESS A HARNESS has been produced by Nife Batteries, of Redditch, Worcs, which enables their hydrogen and pentane safe cap-lamps to be also used as chest-lamps.

These lamps are fully approved by the Inspector of Factories for use in dangerous atmospheres containing hydrogen and pentane fumes, and are considered particularly suitable for use in refineries, chemical works, etc.

The harness is made from 2-in. webbing straps, and both waist and 'Sam Browne' shoulder straps are adjustable for size. A detachable battery pouch can be fitted in a variety of positions on the waist belt, and is designed to carry the battery portion of either the hydrogen or pentane cap-lamps.

NON-RETURNABLE DRUM A NEW product to reach the market is the taper-sided 'T.S.' drum. Manufactured by Reads Ltd., Orrell Lane, Walton, Liverpool 9, it is made from light-gauge material for strength and rigidity with lightness. With a diameter of 11 in. and height of 17 in., it has a capacity of 5 gallons.

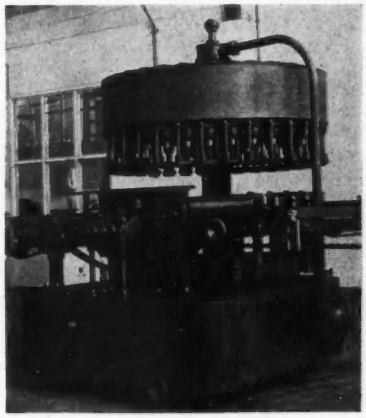
The company claim that it is easily and

New drum by Reads

firmly stacked for space saving, it has a strong, straight side-seam making it less liable to damage in transit and its low initial price makes return freight charges unnecessary. Available in black steel or tinplate with side-seams welded, the drum is said to be particularly suitable for liquid insecticides and other chemical products. It may also be supplied in tinplate with side-seams re-tinned or soldered.

Both styles can be spray-painted or lithographed to the customer's own design. The tinplate drum can, alternatively, be supplied unpainted. There is a choice of standard neck fittings among which are the 50-mm. press cap, 50-mm. RingSeal, polyethylene FlexSpout closure, and the 3-in. seamless neck.

CORROSIVE LIQUIDS FILLER A FULLY automatic rotary vacuum filling machine for bottling corrosive liquids has been manufactured by the Dutch company of n.v. Marja, Koningsweg 2a, Utrecht,



Rotary vacuum filler

Holland. All parts of the machine coming into contact with the liquid, tank, valves, float, etc., are made in an artificial material and all other parts have a corrosive-resisting coating. The machine is intended for the filling of acids, chlorine-bleaching lye and other corrosive liquids.

Features of the vacuum-operated filler include a fully enclosed gear-drive, central lubrication, quick adjustment for different sized bottles, variable speed and a bottle infeed worm.

PHOTO ELECTRIC TITRATOR THE EEL titrator, made by Evans Electroselenium Ltd., Colchester Road, Halstead, Essex, is now in production and meets the demand for an instrument which will operate on colour rather than pH change following the increased use of complexones for titration. The manufacturers claim that the instrument can be recommended for determinations of calcium, fluorides, barium, sulphates and combined calcium magnesium, and that many other determinations can be carried out since any titration involving colour change employs the same principles.

A known volume of sample is placed in a beaker with a buffer solution and to it is added a small amount of indicator. The magnetic stirrer is then switched on to ensure a thorough mixing of solutions which now become coloured. Measured quantities of reagent are then added from a burette with continued stirring, each addition causing a change in colour which, in turn, gives a different reading on the galvanometer scale. If the procedure is continued, a stage is reached when the addition of reagent results in a much greater change in galvanometer readings. The point at which the largest change in reading occurs indicates the end-point.

Commercial News

Manchester Oil Report Larger Profits Despite Difficult Year

THE year ended 31 December 1957 proved a difficult year for Manchester Oil Refinery (Holdings) Ltd., chairman, Mr. Rudolph E. F. de Trafford, reports in his statement. Reaction after Suez resulted in a considerable decrease in the prices of most finished products without a corresponding fall in crude oil prices. However, while margins of profit narrowed considerably group profit before taxation increased slightly. This was £209,520 as compared with £204,820 for 1956. Taxation, other than profits tax, absorbed £103,864, and net profit attributable to the parent company was £103,257, as against £108,154 for the previous year.

A payment of a final dividend of 8½ per cent less tax has been recommended by the directors, making a total distribution for the year of 12½ per cent less tax.

During the year the group incurred net expenditure of £350,057 on capital account. This was principally related to the new sulphonates plant and ancillary storage facilities. These new plants are now completed and are working satisfactorily and profitably. Sales are foreseen for the whole of the sulphonates plant's production for 1958. The chemical products plant, which manufactures alpha and gamma picolines, made a satisfactory contribution to the company's profits in 1957 and its entire potential output for 1958 is already sold forward.

Research work carried out on transformer oil, had led to production of a new type of oil passivated against metals which was now beginning to be widely accepted, particularly for overseas service.

The chairman announces that Petrocarbon Developments Ltd. have completed the alcohol recovery plant, which they designed and constructed for Manchester Oil Refinery Ltd. The plant is stated to be working well. New orders which have been obtained by Petrocarbon Developments include a second research contract for the Atomic Energy Research Establishment, Harwell, and the design of a polystyrene plant for Poland.

Stratton Chemicals Ltd. have continued to make good progress both as a trader in chemicals and as an agent for the sale of chemical plant, and the refinery in Belgium, Albatros SA Belge pour le Raffinage de Petrole who are operating under a processing agreement with the B.P. Company Ltd., had a satisfactory year.

British Chrome and Chemicals

With reference to the new projects started at Glasgow and at the Eaglescliffe works of British Chrome and Chemicals (Holdings) (CHEMICAL AGE, last week, p. 888) it is now learned that these have reached the final planning stages for the modernisation and development of the chromium chemical plants. New plant will be erected on part of the Glasgow works site. A new sulphuric acid contact process plant is to be set up at the Eaglescliffe works and the chromium chemical plants there are to be further modernised.

Major contracts have been placed with the Power-Gas Corporation Ltd. for plant and equipment, with Tarslag Ltd., and Holst and Co. Ltd. for civil engineering work, and with Redpath, Brown and Co. Ltd. for steel work. British Chrome's development department is operating as its own main contractor for the work.

Dunlop Rubber

Record trading profits for 1957 are announced by Dunlop Rubber Co., who are restoring the 14 per cent total dividend paid prior to the 1956 cut to 10 per cent. The final dividend being paid is 11 per cent, against 7½ per cent.

Group trading balance, which in 1956 fell by over £2.4 million to £15,094,662, amounts to £19,859,864. Group available net profit, after substantially heavier tax (£7,458,072 against £4,488,891) is £5,025,605, compared with £3,535,216. The 1955 figure was £5,057,560.

Hickson and Welch

The directors of Hickson and Welch (Holdings) Ltd. have declared an interim dividend of 4 per cent, less income tax at 8s 6d in the £, on the issued ordinary share capital of the company for the year ending 30 September, 1958. This dividend will be payable on 5 June 1958 to the shareholders recorded in the register on the 22 May 1958.

Gas Purification

An interim consolidated income statement of Gas Purification and Chemical for the six months to 31 December 1957, shows a group deficit, before tax, of £130,258. The deficit applicable to the company, after minority interests and writing off subsidiaries' formation expenses, is £133,322, making a total at 31 December 1957, of £334,655.

It is reported that at present 'those companies in the group which had previously been trading at a loss have either turned to profitable trading or are on the way to it, while those which were previously trading at a profit have maintained their earnings, and, in some cases have improved upon them'.

Rio Tinto

Group net profits for 1957 of the Rio Tinto Co. were £1,750,000 (£1,274,000). A dividend of 26 per cent, less tax, is being paid on increased capital (15 per cent, tax free, on old capital). Fixed assets at £6,415,000 (£2,350,000) include net assets acquired from Keru Oil Co.

In his speech the chairman, Mr. Gerald Coke, said that the British atomic power programme will require an increasing annual tonnage of uranium. Between 1,000 and 2,000 tons a year of uranium oxide will be required from the time the first stations have to be fuelled, i.e. from 1961 onwards. Demand will increase steadily until well into the 1970's when it will probably lie between 5,000 and 10,000 tons a year. US civil uranium requirements have been estimated at 20,000 to 30,000 tons of uranium oxide by 1975.

One of the conditions for a continuing high demand is that uranium oxide should be produced cheaply. For established mines that can do this and those who find economical new sources of supply, there should be an ever-growing market, says Mr. Coke.

Offer for Monckton Coke

Ocean Wilsons (Holdings) announces that the offer by its subsidiary, Ocean and United National Collieries, for the shares of Monckton Coke and Chemical, has been accepted by holders of more than 90 per cent of the shares. The offer has, therefore, become unconditional but will remain open until 16 May.

Newton Chambers

In view of the more competitive trading conditions, Newton Chambers and Co. Ltd. had record trading results with profits increased by £88,654 to £805,855, reports chairman, Sir Peter Roberts, in his annual statement (other details concerning the company's results will be found in CHEMICAL AGE, 26 April, p. 782). The increase in profit has justified, it is stated, the heavy capital expenditure of over £1 million which has been undertaken in the past two years.

The chemicals division had a most successful year. Higher turnover and greater efficiency have enabled the division to absorb increased costs of labour and materials without raising selling prices and still show an increasing profit. The very substantial capital expenditure incurred by the chemicals and engineering divisions and a recent acquisition (Ransomes and Rapier, CHEMICAL AGE, 8 February, p. 294) have greatly increased the range of the company's activities. The chemical division is reported to be developing a number of new products for marketing in 1958 and 1959.

At 31 December last, the company was committed to further capital expenditure of £326,000. In addition other schemes are reported to be under consideration and it is expected that a further £200,000 will be required this year.

INCREASES IN CAPITAL

BRITIONA LTD. (formerly Britiona Chemicals Ltd.) 27 Martin Lane, London EC4. Increased by £40,000 in £1 A ordinary shares, beyond the registered capital of £10,000.

SMITH AND NEPHEW ASSOCIATED CO. LTD., 82 King William Street, London EC4. Increased by £1,723,200 in 8,616,000 ordinary shares of 4s, beyond the registered capital of £3 million.

GEIGY (HOLDINGS) LTD., 21 Spring Gardens, Manchester. Increased by £1,250,000 in £1 ordinary shares, beyond the registered capital of £850,000.

People in the NEWS

● DR. J. D. KENDALL, B.Sc., Ph.D., D.I.C., F.R.I.C., consultant chemist, Ilford Ltd., has been appointed chairman of the fine chemicals group, Society of Chemical Industry, in succession to DR. B. A. HEMS (Glaxo Laboratories Ltd.). Other officers elected for 1958/59 are: Vice-chairmen, DR. HEMS, DR. A. C. C. NEWMAN, (development manager, Wellcome Foundation Ltd.); hon. treasurer, DR. R. E. BOWMAN (Parke Davis and Co. Ltd.); hon. recorder, DR. D. S. MORRIS (Parke Davis and Co. Ltd.); hon. secretary, DR. J. H. WILKINSON (Sunderland Technical College). At the annual meeting on 16 May, Dr. Hems was due to give a lecture on 'Is your research policy really necessary'.

● MR. THOMAS F. W. JACKSON has been appointed chairman and managing director, Union Carbide Ltd. UK in succession to MR. W. B. H. GALLWEY who died last December. Mr. Jackson was born in Sydney, Australia, in 1913. Educated at the Scots College in Sydney, he did not join the Union Carbide organisation until 1940 when he was engaged in work for Eveready Australia Ltd. After five years' military service he rejoined the company in 1946 and in the following eight years worked his way up to assistant managing director, and was in charge of Union Carbide's three plants in Australia and one in New Zealand.

T. F. W. Jackson

In October 1954 he became managing director of National Carbon Philippines Inc., and was responsible not only for the ultimate normal trading activities but also the construction of the plant itself. In the Philippines, he also became president of Maria Cristina Chemical Industries Inc. (a partially owned subsidiary of Union Carbide) which manufactures calcium carbide at Iligan City, Mindanao.

Mr. Jackson is also a director of Union Carbide's affiliated companies Gemec Ltd. (chairman and managing), Bakelite Ltd., and British Acheson Electrodes Ltd.

● MR. R. H. DIBB, M.Sc., M.I.Mech.E., engineering director of the ICI plastics division since 1945, is to succeed MR. J. E. BRAHAM on his retirement in September from the post of engineering controller for ICI Ltd.

● MR. R. C. HESKETH-JONES, LL.B., formerly sales director, industrial division, of British Oxygen Gases Ltd., has been appointed chief executive, overseas, at the head office of the British Oxygen Co. In this capacity he will handle the overseas affairs of the Group in direct association with the managing director, MR. T. E. POTTS. MR. R. J. FOSTER, D.F.C., A.F.C., M.A., who has recently been director and general manager of British Oxygen Aro Equipment Ltd., succeeds Mr. Hesketh-Jones. CAPTAIN Q. P. WHITFORD, O.B.E., A.M.I.E.E., R.N. (Retd.), who is taking charge of the aircraft equipment works at Harlow, will thus in future be closely linked with the activities of British Oxygen Aro Equipment Ltd. He was formerly quality control manager of British Oxygen Gases' equipment division at Edmonton.

● DR. V. M. CLARK, M.A., Ph.D., of Gonville and Caius College, has been appointed a university lecturer, and DR. R. I. T. CROMARTIE, M.A., PH.D., of Clare College, a university demonstrator, both in the department of organic and inorganic chemistry, Cambridge University. MR. A. B. CALLEAR, of Emmanuel College, has been appointed a university demonstrator in the department of physical chemistry.

● MR. R. F. STEWART, M.C., A.R.T.C., F.R.I.C., A.M.I.Chem.E., director of Dorr-Oliver Ltd., has been re-elected chairman of the chemical engineering group, Society of Chemical Industry. Other officers for 1958–59 are: Vice-chairman, E. W. GREENSMITH; hon. treasurer, F. A. GREENE; hon. secretary, J. L. SWEETEN; hon. assistant secretary, F. W. EDWARDS; hon. editor, D. M. WILSON; hon. recorder, H. V. POTTER. Group annual meeting will be held on 3 June at the Café Royal, London W1.

● DR. W. W. EASTON, a lecturer in chemistry, chemical technology, engineering science, mathematics and electricity at Bristol Technical Institute, Edinburgh, has been appointed principal of the new technical education centre at Thurso, Caithness. The college is to train engineering apprentices for the Dounreay establishment of the UK Atomic Energy Authority. Dr. Easton's industrial career has been with ICI, Glaxo Laboratories and the research department of T. and H. Smith Ltd.

● Next president of the Institute of Fuel will be MR. T. C. BAILEY, sales manager (industrial fuels), Shell-Mex and BP. He takes office next October. This will be only the second time that a member of the oil industry has held this office.

● PROFESSOR A. B. STEWART, M.A., B.Sc., Ph.D., will resign from the chair of agriculture at Aberdeen University on 30 September, on his appointment as director of the Macaulay Institute for Soil Research, Craigiebuckler, Aberdeen, on 1 October. He will succeed DR. D. N. MCARTHUR, C.B.E., D.Sc., Ph.D., F.R.I.C., the present director.

● MR. J. B. C. CARR has been appointed general manager and secretary of the Fertiliser Manufacturers' Association, in succession to the late DR. G. F. NEW, O.B.E. He has also been appointed secretary of the superphosphate manufacturers' association. Mr. Carr is a barrister and a student of economics, history and international affairs.

● SIR ARTHUR VERE HARVEY, C.B.E., M.P., has been elected a director and chairman of The Clayton Aniline Co. Ltd. and The Clayton Dyestuffs Co. Ltd. in place of MR. A. E. PEAK. Mr. Peak has resigned the chairmanship of these companies but is retaining his seat on the board.

● DR. P. SMITH has been appointed section manager in charge of the heavy chemicals division's organic research project section D of Imperial Chemical Industries, Billingham.

● HRH PRINCE PHILIP, Duke of Edinburgh, has accepted honorary membership of the Parliamentary and Scientific Committee. At a recent meeting of the committee MR. ROY MASON, MP, and MR. R. PRENTICE, MP, were unanimously elected members.

● MR. A. J. PRINCE, development director of the heavy organic chemicals division of Imperial Chemical Industries Ltd., has completed 30 years' service with the com-

At the open day of the British Rayon Research, l. to r. Dr. T. Grosberg, Mr. F. Frank and Professor L. Peters (all from Leeds University); Dr. L. R. G. Treloar, senior physicist (fundamental) head of BRRA physics dept., Dr. A. Sharples, senior chemist (fundamental) head of BRRA chemistry dept.

pany. He joined ICI as a chemist in the Billingham research department, becoming plant manager of the nitrates group in the following year. In 1936 he was appointed products research manager, and at the outbreak of war became products technical manager. He was appointed to the board as Billingham division development director in 1951 and took over his present position at the beginning of this year.

Dr. D. J. Manners, who as stated last week, has won the Meldola Medal, 1957, for his work at Edinburgh in the field of polysaccharide chemistry

● MR. A. FRASER MCINTOSH has been re-elected president of the Industrial Pest Control Association for a second year. Mr. McIntosh is manager of Thomas Harley Ltd., Rodine Works, Perth.

Other officers elected are: vice-president, D. J. S. HARTT, May and Baker Ltd.; hon. treasurer, S. FARROW, The London Fumigation Co. Ltd.; executive committee, G. CAMPBELL, The Geigy Co. Ltd.; DR. E. R. GOODLIFFE, Ratsouris Ltd.; S. W. HEDGCOCK, Disinfestation Ltd.; C. A. E. STUART KREGOR, W. Edmonds and Co. Ltd.; I. A. MACKAY, ICI. MR. W. A. WILLIAMS, M.B.E., B.Sc., is secretary.

● MR. M. A. E. HODGSON has been appointed head of the newly formed technical department of Imperial Chemical Industries Ltd. at head office in London. Mr. Hodgson was to have been technical service and development manager of the new heavy organic chemicals division. This post will now be filled by Mr. J. S. A. Forsyth of ICI (New York) Ltd. who is expected to take up his appointment in June.

● LORD VERULAM, chairman of Sternol Ltd. and Enfield Rolling Mills Ltd., has been elected chairman designate of the British Institute of Management.

● MR. D. P. G. MOSELEY (David Moseley and Sons Ltd.), and MR. P. L. SHERWOOD (Wm. Warne and Co. Ltd.), were re-elected chairman and vice-chairman, respectively, of the Federation of British Rubber and Allied Manufacturers at the recent annual meeting.

● DR. W. A. SEXTON and DR. W. G. TEMPLEMAN, both of ICI, have been jointly awarded the Royal Agricultural Society's research medal for this year. Dr. W. A. Sexton, who studied at Liverpool University, receives the award for his work as director of chemical and biological research at ICI's pharmaceutical division, Alderley Park, Cheshire. Mr. Templeman graduated from Imperial College, London, and since then has worked at the Jealott's Hill Agricultural Research Station of ICI. He is now deputy head of the station, and associate research manager in charge of the biological section. Mr. Sexton and Mr. Templeman are credited with the joint discovery in 1940 of hormone and carbamate weedkillers.

● MR. J. R. MOORE has been appointed a director of the Fisher Governor Co. Ltd. of Rochester (a member of the Elliott-Automation Group).

● MR. A. E. CURTIS and MR. N. C. HODSON have been appointed directors of Aldridge Plastics Ltd., a subsidiary of Siemens Edison Swan Ltd. They are respectively works manager and London sales manager.

Mr. Curtis joined Aldridge Plastics in 1955 as works manager. Before that he was works superintendent and commercial manager of Moulded Products Ltd. Mr. Hodson joined Aldridge Plastics in May 1957 when he opened the London sales office at 155 Charing Cross Road.

● MR. DAVID F. CRAIG has been appointed to the board of Liquid Systems Ltd., Norwich Union House, Wellesley Road, Croydon.

Wills

MR. FRANK ALBERT KEELING, of Brocton Lodge, Stafford, managing director of Keeling and Walker, chemical manufacturers, Stoke on Trent, left £105,719 net (duty paid £47,655).

MR. SIDNEY CHARLES CASE-GREEN, of Thistleworth, Beare Green, near Dorking, Surrey, founder of British Wax Refining Co., left £29,366.

TRADE NOTES

Change of Address

LONDON AND THAMES HAVEN OIL WHARVES LTD. have changed their address from St. Helen's Place, London EC3, to Bucklersbury House, 83 Cannon Street, London EC4. Their new telephone number is City 7931.

Tanning Extracts

Two companies are withdrawing from the sale of liquid and powdered vegetable tanning extracts. They are Walker Extract and Chemical Co. Ltd., Bolton, and Yorkshire Dyeware and Chemical Co. Ltd., Leeds. Both firms will continue to produce synthetic tanning materials.

PTFE Hydraulic Hoses

The first entirely British-made dispersion polymer p.t.f.e. hydraulic hoses are now being marketed under the trade name Palmer Fluoroflex by Palmer Aero Products Ltd., Herga House, Vincent Square, London SW1. Previously obtainable only from dollar sources, they are being made available by Palmer, to users both at home and overseas, with swaged-on or re-useable end-fittings.

Fisons Produce Kil

A compound insecticide, claimed to be unlike anything hitherto available, has been produced by Fisons Ltd., 95 Wigmore Street, London W1. Known as Kil, the new product is a blend of malathion and DDT.

It is claimed to be completely harmless to all plants except those of the marrow family, which 'dislike' DDT, and to control a wider range of insects than any other insecticide.

New Surface Active Agents

In process of development by Glovers (Chemicals) Ltd. are two series of amphoteric surface active agents, the Amphionics and the Ambiterics. The Amphionics are derivatives of long chain amino acids and the Ambiterics are long chain substituted betaines or internal quaternary ammonium compounds. Those offered at present are based essentially on the dodecyl and hexadecyl chain lengths. It is claimed that these agents can, by careful variation of pH, be made to simulate the properties of anion, caton or non-ion active surface agents at will. Among suggested uses are in paint and polish manufacture.

Metaquest Brochure

Applications of Metaquest EDTA, made by Whiffen and Sons Ltd., Fison House, 95 Wigmore Street, London W1, are described in a new brochure published by the company. There are six varieties of Metaquest available and information is contained on the choice of the most suitable.

New Telephone Number

Cawley Plastics Ltd. of Byfleet Road, Weybridge, Surrey have added another telephone to their Weybridge 4543 number. The new number is Weybridge 4544.

Hindle form French Firm

Joshua Hindle and Sons Ltd., Leeds, valve manufacturers, have formed a company in Paris, Hindle-Hamer Francaise. Located at 6 Avenue Franklin-Roosevelt, the company will make Hindle products, as well as products made by Hindle under license from Hamer Valve Inc., US.

1958 BDH Catalogue

The 1958 catalogue of laboratory chemicals has been published by British Drug Houses Ltd., Poole, Dorset. Chemical formulae, molecular weights and specifications, which were first introduced in the 1956 edition, are included with some extensions in the present volume. Apart from a few exceptional items all liquid chemicals are listed and priced by volume. The approximate density of each is shown.

John Thompson at Grangemouth

In our issue of 3 May, p. 824, we pictured one of the three dehydrogenation units recently built for Forth Chemicals Ltd. at Grangemouth. We should like to point out that these units were not in fact made by John Thompson Ltd. This company supplied vertical pre-heaters, low-pressure desuperheaters, water separators and a number of small converters and rundown tanks.

600

GEORGE COHEN SONS AND COMPANY LIMITED

announce that they have acquired
the Entire Contents of the large Works
operated until recently by

HEMINGWAY & CO. LTD.

Chemical Manufacturers
22/28 Marshgate Lane, Stratford, London, E. 15

The

CHEMICAL AND PROCESS PLANT FOR SALE

includes

FILTRATION PLANT : RUBBER-LINED TANKS AND MIXERS : ACID PUMPS : VACUUM PUMPS PRECIPITATION VESSELS : EVAPORATING PANS HEAT EXCHANGERS : LEAD-LINED TANKS ROTARY AND ROLLER DRIERS : GARDNER TYPE POWDER MIXERS : "LIGHTNING" CRUSHERS "BEKEN" MIXERS : ATTRITORS by Alfred Herbert, CONVEYORS AND STORAGE BUNKERS, etc. etc.

Catalogues from :
Process Plant Department, 600, *Wood Lane, London, W.*12. (*Telephone : SHEpherds Bush* 2070)
Sales Representatives are in attendance on the spot at Stratford (*Maryland* 4577) *and inspection of the excellent Plant available is invited.*

GEORGE COHEN

SONS AND COMPANY LIMITED

600, WOOD LANE · LONDON · W.12

Telephone : SHEPHERDS BUSH 2070 Telegrams : OMNIPLANT, TELEX, LONDON

THE 600 GROUP OF COMPANIES

And at : Stanningley, (Nr. Leeds); Kingsbury (Nr. Tamworth); Manchester; Glasgow; Swansea; Newcastle-on-Tyne; Sheffield; Southampton; Belfast; Bath

Chemical Stocks and Shares

STRIKE INFLUENCES

Fisons as a 'Growth' Investment

THE labour situation has dominated the markets over the last two weeks and consequently prices have tended to drift on average a little lower; however, industrial equities, together with chemical shares, have seen little selling.

The investor, faced with a bus strike and the possibility of a stoppage on the railways, has been reluctant to sell good stock. A prolonged transport strike would undoubtedly cause considerable harm to the economy. It is, of course, too much to expect a Bank Rate reduction until the strike fears are resolved.

1958 High	1958 Low	Security	13 May	Change over last two weeks
20/3	16/9	Albright & W. 5/-	20/3	+6d
10/9	10/3	Anchor 5/-	10/3	—
1/3	1/-	Ashe Chemical 1/-	1/3	+1½d
20/7½	16/3	Bakelite 10/-	19/-	—3d
6/4½	4/6	Berk (F.W.) 5/-	5/7½	—4½d
20/4½	14/10½	Borax Defd. 5/-	17/6	+1/9
10/3	8/9	British Chrome 5/-	9/4½	—6½d
12/10½	10/4½	British Glues 4/-	12/1½	—9d
5/10½	5/-	BIP 2/-	5/7½	—3d
8/6	7/7½	Bt. Tar Prod. 2/6	8/6	—
35/3	28/3	British Xylonite	35/-	—
4/3	3/6	Coalite & Chem. 2/-	4/3	+1½d
8/1½	7/6	Hardman & H. 5/-	8/1½	—
34/9	31/-	Hickson & W. 10/-	34/9	+6d
45/-	36/4½	ICI	43/9	—6d
3/4½	2/7½	Kleemann 1/-	3/1½	—1½d
17/3	14/-	Laporte 5/-	17/-	—1½d
15/-	13/9	Lawes 10/-	15/-	—
16/1½	12/6	Monsanto 5/-	15/9	—3d
13/-	11/-	Reichhold 5/-	11/6	—3d
9/-	8/6	Yorkshire Dye 5/-	9/-	—

In the chemical section British Xylonite and Fisons improved to 35s and 46s respectively, while Borax advanced a few pence to 17s 6d on, it is understood, American buying.

A share which has also suffered from the general market uncertainty is Fisons. Last week they announced a £3 million rights issue on the basis of one new £1 ordinary at 31s 3d for every £3 ordinary stock held. The new and old rank *pari passu* except that the new will not be entitled to the 5 per cent interim dividend the board intends to declare for 1957/58. Dealings in their new form are 46s for the old ex rights and 15s for the new, which, on their proposed 15 per cent dividend on the enlarged capital, yield about 6½ per cent.

Fisons, established as a public company in 1929, have made considerable strides in the vast chemical fertiliser industry over the years and consequently are always facing the need of finances for their very large expansion programme.

Fisons Pest Control Ltd., a subsidiary of the group, have recently announced an agreement with Geigy, envisaging co-ordination of all aspects of research, optimum usage of manufacturing facilities and a fusion of distributive services.

At Ipswich, Fisons' Bramford horticultural fertiliser plant has been completely remodelled at a cost of £265,000 and will shortly be working to full capacity in the important field of horticultural fertilisers.

For the future, Fisons have a number of important projects in hand which should bring increased earnings before long. At today's prices, their shares seem a very worth-while 'growth' investment.

Power-Gas to Supply Reforming Plant to Kali

The chemical plant division of The Power-Gas Corporation Ltd., Stockton-on-Tees, has obtained an order from Kali-Chemie AG, Hanover, Germany, for the supply of a Power-Gas/Hercules reforming plant. This unit, which is similar to others erected in the UK, is based upon liquid hydrocarbon feedstock and comprises a tubular cracking furnace followed by carbon monoxide conversion, carbon dioxide removal and a methanation stage to provide the highest possible purity of the final hydrogen.

New House Journal

First issue of their own house journal 'The H. and T. News,' has been published by Houseman and Thompson Ltd., water treatment specialists, DM House, Jesmond Road, Newcastle-upon-Tyne 2. In the form of a newspaper, this has been produced by the Dutch company in co-operation with head office, Newcastle, and was printed in Holland. This new quarterly publication will cover the activities of Houseman and Thompson Ltd., Houseman and Thompson (Research) Ltd., Disincrustant Marseillais Co. Ltd., Heron Heating Devices Ltd., and M.R.B. in Holland, plus those of more than 60 overseas agents. Copies are available from the company's information department.

Publications Received

Review of Benzole Technology 1956: The National Benzole and Allied Products Association, Wellington House, Buckingham Gate, London SW1.

Automatic Countercurrent Apparatus, Automatic Fraction Collector and Student Balances: J. W. Towers and Co. Ltd., Victoria House, Widnes.

Control of Pests in Stored Agricultural Products: OEEC, 2 rue Andre-Pascal, Paris 16.

Applications of Atomic Science in Agriculture and Food: OEEC, 2 rue Andre-Pascal, Paris 16.

Annual Report of the British Plastics Federation: The British Plastics Federation, 47-48 Piccadilly, London W1.

Protective Coatings Guide: Tretol Ltd., Tretol House, The Hyde, London NW9.

Patent Gas Washer and Gas Absorption: Kestner Evaporator and Engineering Co. Ltd., 5 Grosvenor Gardens, London SW1.

Monsanto Dielectric Fluids; Aroclors, Pyroclor: Monsanto Chemicals Ltd., Monsanto House, 10-18 Victoria Street, London SW1.

Kabi Bench Assembly Trays, Storage and Tote Bins: Precision Components (Barnet) Ltd., 13 Byng Road, Barnet, Herts.

Plant for Disposal

George Cohen, Sons and Co. have acquired, and will be disposing of, the entire plant of the works at Marshgate Lane, Stratford, operated until recently by chemical manufacturers, Hemingway and Co.

Market Reports

CHEMICAL PRICES REMAIN FIRM

LONDON Demand for chemicals remains on a moderate scale and the market has shown no outstanding feature on the week. Contract deliveries to the chief home consuming industries have covered good quantities but there is room for improvement in the placing of new forward business. Supplies of most products are fairly easy, but the price position is unchanged and firm. Export trade enquiry covering a wide range of industrial chemicals is keeping up to a good level. Among the tar products cresylic acid and carbolic acid are moving in good quantities and there is a good interest in creosote oil on home and export account.

MANCHESTER Traders on the Manchester chemical market during the past week report less pressure for contract deliveries of heavy chemicals from the textile and allied industries, but with one or two other exceptions the main industrial outlets are calling for reasonably steady supplies. Replacement buying, however, tends to be increasingly restricted to nearer delivery positions. Little in the way of price changes has been reported. A few sections of the fertiliser trade are still experiencing active conditions, but in other respects there are signs of the approaching end of the season. The tar products are mostly being called for steadily against contracts.

GLASGOW Prices during the past week have remained more or less on a steady basis. The general tone of the Scottish heavy chemical market, however, had still a tendency to be quiet, which was particularly apparent in some sections of industry. Against this, in regard to agriculture chemicals, there has been a continued volume of activity, and demands have been well maintained in keeping with seasonal requirements. A varied number of enquiries is still being received for the overseas market, which remains at a good level.

DIARY DATES

TUESDAY 20 MAY

Parliamentary and Scientific Committee—London: Committee Room 9, House of Commons SW1. 5.15 p.m. Meeting of general committee.

SCI Chemical Engineering Group—London: 14 Belgrave Square SW1. 5.30 p.m. 'Factors involved in the preparation of contracts' by C. W. Hart-Jones.

WEDNESDAY 21 MAY

Parliamentary and Scientific Committee—Visit to Cooper, McDougall and Robertson Ltd., Berkhamsted.

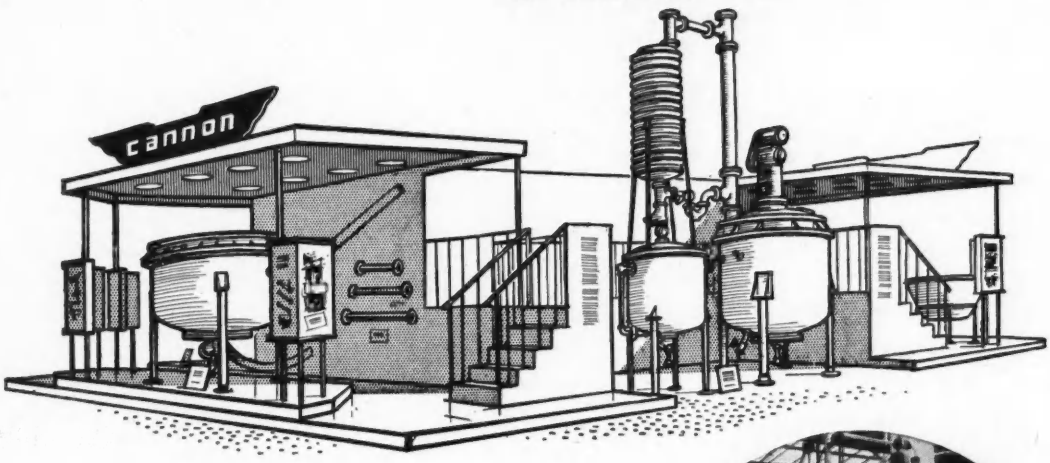
Royal Institution—London: 21 Albemarle Street W1. 9 p.m. 'The architecture of the protein molecule' by John C. Kendrew.

THURSDAY 22 MAY

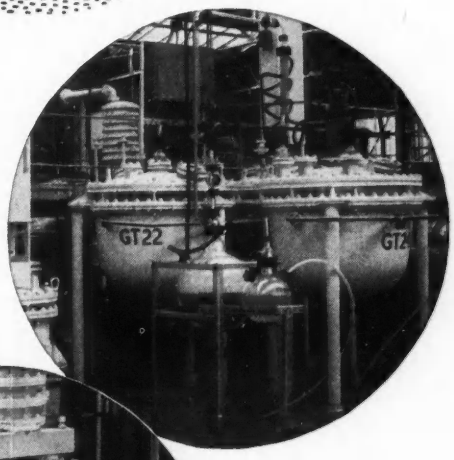
SAC Biological Methods Group—Visit to Imperial Chemicals (Pharmaceutical) Ltd., Alderley Park, Macclesfield, Cheshire.

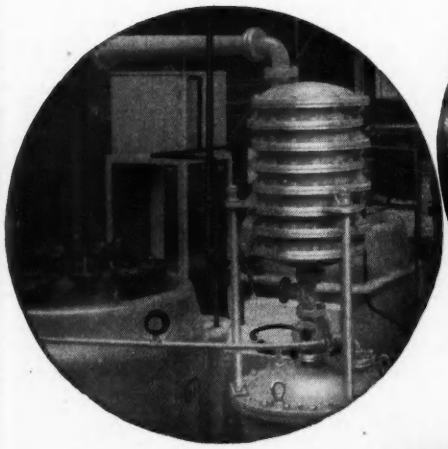
cannon acid resisting

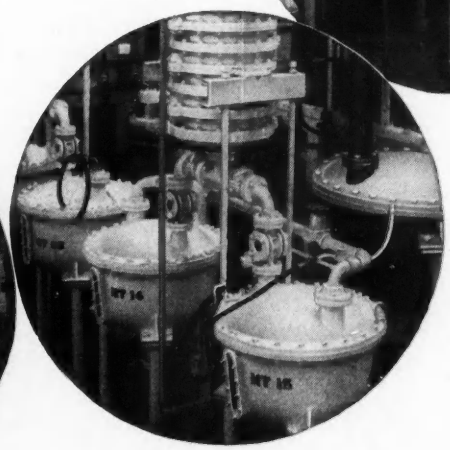
glass lined **CHEMICAL PLANT**



On Stand No. 8 GRAND HALL, OLYMPIA—Chemical and Petroleum Engineering Exhibition CANNON are displaying a wide range of equipment as used in the Chemical and Allied Industries. Our Senior Technical Executives will be available throughout the Exhibition to advise on your particular requirements.







Installation photographs by courtesy of F. W. BERK & Co. Ltd.

CANNON (CP) LTD., DEEPFIELDS, BILSTON, STAFFS.

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sale Branch), 25 Southampton Buildings, Chancery Lane, London WC2, price 3s. 3d. including postage; annual subscription £8 2s.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

ACCEPTANCES

Open to public inspection 11 June

Construction of combustion chambers, flame tubes and the like. Lucas (Industries), Ltd., J. **796 501**

Synthetic lubricant. Esso Research & Engineering Co. **796 505**

Metallisable monoazo dyestuffs, complex heavy metal compounds thereof, and their use. Geigy, AG., J. R. **796 350**

Oil-modified alkyd resins. California Research Corp. **796 355**

Reduction of aromatic nitrogen compounds. Allied Chemical & Dye Corp. **796 356** **796 421**

Reaction of organic compounds containing hydroxyl groups with ethylene oxide. Henkel & Cie Ges. **796 508**

Polyacrylonitrile solutions. Courtaulds, Ltd. [Cognate applications 31157, 14678, and 19227.] **796 294**

Fuel oil composition containing combination of aliphatic and alkyl amines. Socony Mobil Oil Co., Inc. **796 427**

Salt of phenoxymethyl penicillin. Abildgaard, K. [trading as Lovens Kemiske Fabrik Ved. N. Konsted]. [Cognate applications 34334, and 37443.] **796 359**

Rubber chemical compositions. Monsanto Chemicals, Ltd. **796 571**

Trichlorobenzoic acid. Heyden Chemical Corp. **796 361**

Process for recovering an antibiotic mystatin. Olin Mathieson Chemical Corp. **796 512**

N-substituted amides. Imperial Chemical Industries, Ltd. **796 572**

Heterocyclic compounds. Olin Mathieson Chemical Corp. **796 362**

Heat treatment of material of synthetic linear polymers. British Nylon Spinners, Ltd. **796 363**

Quaternary ammonium compounds. Eprova AG. **796 364**

Container lids. British Xylonite Co., Ltd. **796 514**

Process for densifying colour grade carbon blacks. Cabot, Inc., G. L. **796 433**

Apparatus for the continuous liquid treatment of artificial thread and the like. Courtaulds, Ltd. **796 367**

Producing phenol-aldehyde resins. Aktiebolaget Höganäsmetoder. **796 515**

Paints, lacquers and the like coating compositions. Watson, G. H. R. (Naamlooze Vennootschap Verf-En Vernisfabriek W. Paulussen). **796 368**

Pest combating compositions. Harford, A. D., and Vernon, H. W. **796 436**

Treating calcium carbonate powders. Produits Chimiques et Mineraux. [Addition to 747 842.] **796 375**

Process and device for the purification of sewage. Nederlandse Organisatie Voor Toegepast-Natuurwetenschappelijk Onderzoek ten Behoeve van de Volksgezondheid **796 438**

Decontamination of acidic solutions. Atomic Energy of Canada, Ltd. **796 441**

Manufacture of salts of terephthalic acid. Imperial Chemical Industries, Ltd. **796 377**

Production of polyethers. Celanese Corp. of America. **796 556**

Heating finely-divided solid reactants. Union Carbide Corp. **796 236**

Phosphorus - containing polyester resins. Albright & Wilson (MFG.), Ltd. **796 446**

Production of staple fibres from polyethylene terephthalate filaments. Vereinigte Glanzstoff-Fabriken AG. **796 557**

Apparatus for the storage of liquefied gases. British Oxygen Co., Ltd. **796 450**

Modified hydrolysed ethylene vinyl ester interpolymers. Du Pont de Nemours & Co., E. I. **796 573**

Hydroxyalkylcyclopolysiloxanes. General Electric Co. **796 456**

Water-soluble silane compositions and process for treating fibrous glass materials. Union Carbide Corp. **796 574**

Process for producing anion exchangers. Cerny, J., and Wichterle, O. **796 457**

Chromium complex compounds of monoazo pyrazolone dyestuffs. Sandoz, Ltd. [Addition to 754 270.] **796 381**

Sweetening hydrocarbon oils. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. **796 382**

Production of articles of cellulose triesters by wet spinning. Celanese Corp. of America. **796 384**

Production of solid polymers. Phillips Petroleum Co. **796 530**

Lipoamide. Merck & Co., Inc. **796 563**

Lipol. Merck & Co., Inc. **796 564**

Synthesis of steroids. Olin Mathieson Chemical Corp. **796 3**

Process for the manufacture of hydrogen peroxide. Columbia-Southern Chemical Corp. **796 4**

Light-stable pure gum butyl vulcanizates. Esso Research & Engineering Co. **796 3**

Separating acidic gases from fluid mixtures. Williams, W. P. (Socony Mobil Oil Co., Inc.). **796 5**

Improving alcohol quality. Esso Research & Engineering Co. **796 5**

Plasticised and heat and light stabilised polymeric compositions. Union Carbide Corp. **796 3**

Acetaldol condensation product. Shawinigan Chemicals, Ltd. **796 5**

Derivatives of tetrahydro-β-carboline. Soc. des Usines Chimiques Rhone-Poulenc. **796 4**

Derivatives of oxopiperazinoalkylhalophenothiazines. Searle & Co., G. D. **796 3**

Water-soluble thermoplastic cellulose ether composition. Abbey, A. (Dow Chemical Co.). **796 3**

Means of separating elastic fluid and liquid. Babcock & Wilcox, Ltd. **796 5**

Polymerising vinyl chloride in aqueous suspension. Dow Chemical Co. **796 3**

Polysiloxane compounds. Union Carbide Corp. **796 5**

Polysiloxane compound. Union Carbide Corp. **796 5**

Anticoagulant and a method of preparing same. Roubal, Z. **796 4**

Treatment of aromatic and unsaturated distillates. Esso Research & Engineering Co. **796 5**

Esters of spiramycins. Soc. des Usines Chimiques Rhone-Poulenc. **796 3**

Combination process for refining and reforming hydrocarbon oils. Universal Oil Products Co. **796 3**

Process and apparatus for the manufacture of copper sulphate. Unterharzer Berg- und Hüttenwerke Ges. **796 5**

Durene recovery process. Esso Research & Engineering Co. **796 4**

Recovery of crystallisable hydrocarbons. Esso Research & Engineering Co. **796 4**

O-aryl o-methyl phosphoroamidothioates. Dow Chemical Co. **796 4**

Preparation of anthraquinone. Koppers Co. Inc. **796 3**

Salt of spiramycin with an organic arsenical compound. Soc. des Usines Chimiques Rhone-Poulenc. **796 4**

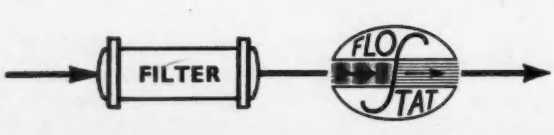
Copper-containing trisazo dyestuffs. Farbenfabriken Bayer AG. **796 3**

Uniting glass or ceramic materials to metal. Standard Telephones & Cables, Ltd. **796 3**

Fungicides. Fahlberg-List Ges. **796 3**

Metal ceramic product. Union Carbide Corp. [Divided out of 787 273.] [Addition to 788 919.] **796 4**

Flostats for Filter Efficiency



No matter what changes of pressure occur at inlet *or* outlet, the Flostat controls the flow at a constant rate.

The complete elimination of surge allows solids to be deposited lightly and evenly, so that the maximum amount of matter can be filtered out before efficiency is reduced by sealing.

A 30% increase of filter life is commonly experienced. Write now for further details.

SOLE MANUFACTURERS: **G. A. PLATON LTD.** Technical Service for Industry
323A, WHITEHORSE ROAD, CROYDON, SURREY. Telephone: THOrnton Heath 1631